BOATSWAIN'S MATE CURRICULUM

EIGHTH COAST GUARD DISTRICT RESERVE

U-S-. C-G-. Eigth District.

Jan 77

INTRODUCTION

The Eighth Coast Guard District Reserve Boatswain's Mate curriculums are designed to *assist* Coast Guard Reserve units to meet the professional requirements for the advancement of enlisted personnel in the Boatswain's Mate rate.

This curriculum is designed to *help* and *guide* unit instructors to *plan* their assigned instruction sessions. It is not the intention that these plans and guides be so specific as to preclude the unit instructors from researching, planning and studying for assigned instructor tasks.

The lesson plans are numbered to correspond with the seven major subjects contained in part 2.5.1 for Boatswain's Mate of the Enlisted Qualifications Manual, CG-311.

TABLE OF CONTENTS

E. Gunnery

E001	Administration of Ordnance Material
E002	U. S. Rifle
E003	.30 Cal Shoulder Line Throwing Gun
E004	.45 Cal Automatic Pistol
E005	.50 Cal Browning Machine Gun (HB) M2
E006	20 MM Anti-Aircraft Machine Gun
E007	81 MM Mortar, MK 2 Mod 0
E008	Ammunition Handling
E009	Pyrotechnics

F. Damage Control

F001	Oxygen Breathing Apparatus
F002	Flame Safety Lamp and Explosimeter
F003	Fire Pumps
F004	Dewatering Equipment
F005	" "
F006	Collision Procedures
F007	Shoring
F008	Plugging and Patching
F009	Compartmentation
F010	Material Conditions of Readiness
F011	Damage Control Equipment (DC Kits)
F012	Emergency Cutting Outfit
F013	Atomic Energy I (Basic)
F014	Atomic Energy II (Basic)
F015	Nuclear Explosions and Effects
F016	Radiation Detection Meters (AN/PDR-18)
F017	Radiation Detection Meters (AN/PDR-27)
F018	Radiation Detection Meters (AN/PDR-43)
F019	Personnel Equipment for Detection of Radiation
F020	Protective Clothing and Gas Mask
F021	Nuclear Attack and Decontamination Procedures
F022	Personnel Decontamination Procedures
F023	Biological Warfare Agents and Procedures
F024	Chemical Warfare Agents and Procedures
F025	Chemical Detection Kits
F026	Biological Decontamination Procedures
F027	Chemical Decontamination Procedures

G. Aids to Navigation

G001	Aids to Navigation System
G002	Boom Operation
G003	Batteries Used in Buoys
G004	Flashers
G005	Buoy Appendages
G006	Buoy Handling Tools
G007	Buoy Maintenance
G008	Aids to Navigation Construction Type
G009	Precautions in Welding and Cutting Work with the Oxygenacetylene Torch

NUMBER A-001

TITLE

Standard Shipboard Organization

OBJECTIVE

To familiarize the ship's personnel with the basic organization to be found on board all ships.

REFERENCES

1. Coast Guard Regulations, CG 300.
2. Own Ship's Organization Book, CG-260 series.

TRAINING AIDS

1. Blackboard, chalk, eraser.
2. Chart at end of lesson plan.

INTRODUCTION

For Instructor Only:

Due to the variety of organizations which may exist, the complexity of organization, and the large amount of material available on basic principles, this lesson plan is written in text form in an attempt to simplify and condense the basic information.

The chart at the end of the lesson plan should be drawn on the blackboard before commencing the lesson, or otherwise presented; use a poster if no blackboard is available. It is best to give Section I of the lesson first without trying to use the chart. The information may be read if you understand it well. If not, you should study it and the references first. Allow for questions at the end of the section.

When presenting Section 2, indicate the appropriate spot on the chart and read the material. Then write on the blackboard, next to that block, the name or names of the person or persons who are assigned to that duty on **board** your ship. When completed, the trainees will be able to see exactly who they work for and who they report to.

Remember that, although your own Organization Book may not refer to a part of the organization which is indicated on the chart, the function must still be performed and someone is assigned to it. When you are done, it is possible that your ship is violating one

of the basic principles. If this is so, see if the trainees can spot this violation and determine how to correct it. Whenever there are three or more persons involved in performing work which is to produce one single result, some type of organization is necessary. On board Coast Guard ships, this organization is generally explained by the Coast Guard Regulations, CG-300.

PRESENTATION

1. The principles which must be covered in any organization are: unity of command, homogeneity of assignment, span of control, and delegation of authority.

a. Unity of Command. This principle requires that each individual in the organization report to and receive orders from any one superior. Only one person should have control over any one part. You don't want two or three people telling you how to paint a bulkhead. You would probably be so confused you wouldn't know how it should be done. (Ask the trainees if they can think of anymore examples.)

b. Homogeneity of Assignment. Each of the functions which must be performed in order for the ship to accomplish its mission should be grouped together with other similar functions. Any single part of the organization should be assigned only those duties and functions which are similar. As an example, the Ordnance Department should not have any engineering duties, and the Engineering Department should not have any ordnance duties. (Ask the trainees if they can think of other examples.)

c. Span of Control. This refers to the number of persons supervised by any other one person, the area involved in the supervision, the time available for supervision, and the way in which the supervisor must use his time. Normally, the number of persons should be three to seven. The area, time, and method are determined by the type of work and its complexity. If one man must directly supervise fifty men who are painting in different compartments on the ship, he will not supervise closely enough in some areas and the work may not be done as well or as quickly as it is in those areas he does closely supervise. (Ask for other examples from the trainees by calling on individuals by name.)

d. Delegation of Authority and Assignment of Responsibility. The authority needed to accomplish a job should be delegated to the lowest level in the organization which is fully capable of using the authority correctly. This never means that the person who

delegates this authority can include responsibility in his delegation. He always remains responsible for the actions of the persons to whom such authority is delegated.

2. The basic parts of shipboard organizations in the Coast Guard are the Command Executive, Department, Division and Section.

a. Command. This part of the organization is the Commanding Officer or Officer-in-Charge.

(1) Responsible for accomplishing mission.
(2) Can delegate authority but not responsibility.
(3) Can only be relieved of all or part of his responsibilities, but only by competent authority such as a District Commander. The relieving officer is then responsible.

b. Executive. This part of the organization consists of the Executive Officer/second-in-command and the department heads. This group executes the orders, directives, etc., which are issued from the command level.

(1) Executive officer/second-in-command is the supervisor at the level, but also has specific duties in the administration of the whole ship. In this position, he is the administration department head. He must also know everything which the command level knows, in order that he may perform the functions of command when no other person is assigned or the assigned person is absent. He coordinates the work of the department head.

(2) Department heads always report to the supervisor (X.O./second-in-command) but are allowed to also report to the command level. Complexities in departments are often more easily explained directly. They must always report to the supervisor first who determines if direct reporting to command is required.

c. Department. The primary working unit of the shipboard organization is the department. On board Coast Guard ships, these departments are Operations, Engineering, Deck, and Supply departments. Administration is not a designated department, but for our purposes it is considered as such in order to understand its proper relationship to the organization.

(1) Depending upon size and personnel available, departments may be divided into smaller units such as is required for Gunnery, Navigation, C.I.C., etc.

(2) Administration department. As previously explained, administration is not a designated department. The various duties concerning administration and personnel (transfers, training, morale, etc) must be placed in their proper place in order to understand them. From the duty and function angle, these are properly considered at the department level. These duties and functions are further divided into divisions and then sections.

(a) Division. The division provides the ship with the basic unit for performance in assigned duties, training, exercises, instructions and upkeep. Divisions usually consist of all the personnel of a department or departments. If the personnel of more then one department is in a division, one of the department heads is usually assigned as division officer. If the division personnel are derived from only one department, the department head may be the division officer, although if there is mot than one officer in the department, one of the others may be assigned. If no officers are assigned, or one officer has more than one department, then senior petty officers may be designated.

1. The division officer reports to the executive officer/second-in-command since that person is the department head for division function.

(b) Sections. The section is in the organization as the smallest working part of a ship. There may be two, three or four sections in each division. If these sections are properly manned, only one section of a division is required to perform the minimum required duties and functions of the division. Therefore, a ship should be able to get underway one section from each division and still be able to perform the mission. However, all sections of all divisions must be on board in order to perform the mission at the ship's best ability. Because of this arrangement, a portion of the crew may be allowed to go ashore.

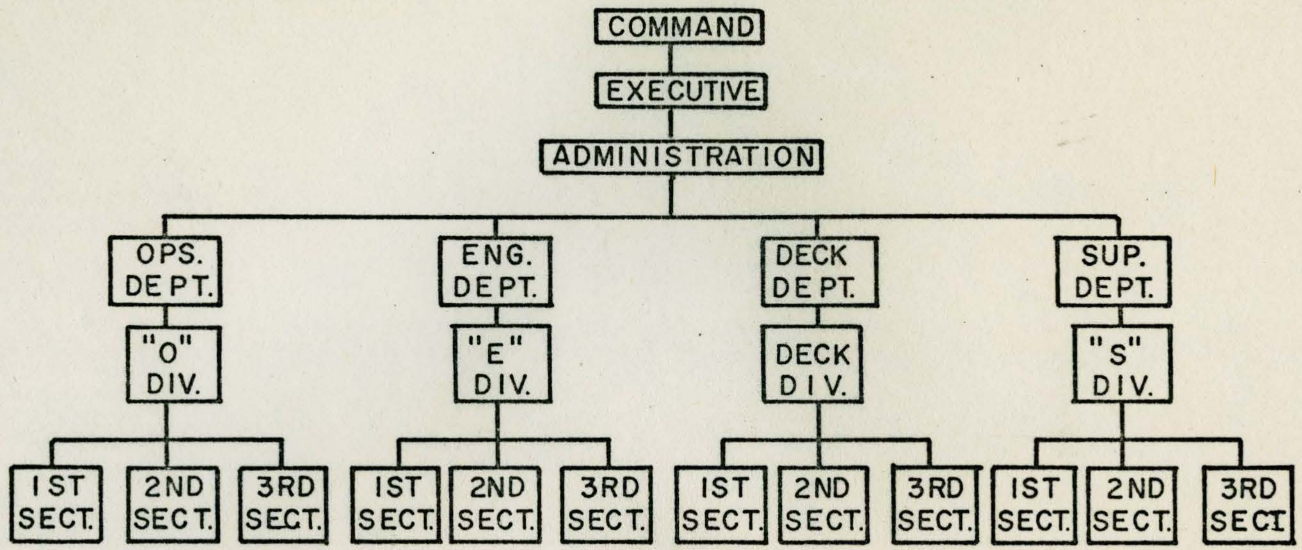
1. Section leader is the supervisor for the section and is usually the senior petty officer in the section. He reports to the division officer.

SUMMARY

The basic principles of shipboard organization are unity of command, homogeneity of assignment, span of control, and delegation of authority.

The basic organization by function or duty consists of two arrangements - one for administrative functions and the other for departmental functions. The position of an individual must be such that he performs his duties under the direction of only one man whether it is an administrative or departmental duty.

One nonrated man, therefore, reports to his section leader, who reports to his division officer/petty officer, who reports to the executive officer for administrative subject (request for emergency leave) or the department head for departmental subjects (reporting a burned out main engine bearing). The department head may also be the division officer, but for departmental subjects, he reports to the X.O./second-in-command and the C.O.



STANDARD SHIP ORGANIZATION

NUMBER A001

TITLE
Log Entries.

OBJECTIVE
To familiarize trainees with the correct manner of log entries and care of logs which are official records of the unit.

REFERENCE
1. Coast Guard Regulations CG-300

TRAINING AIDS
1. Blackboard and chalk.
2. Actual log.
3. Loose pages from old log.

INTRODUCTION
In the Coast Guard everyone should know how to keep a log and keep it correctly. It is readily apparent when the logs are reviewed that standardization of entries is necessary.

PRESENTATION
1. Logs
    a. Official Government record
        (1) Regardless of age, type or condition.
    b. Preparation.
        (1) Entries - using time of events.
            (a) Log all assistance cases.
            (b) Course and speed changes.
            (c) Drills and instructions held.
            (d) Arrival and departure of official visits.
            (e) Weather by symbols (found in front of log).
            (f) Other entries as appropriate.
            (g) Mooring and unmooring.
    c. Responsibilities.
        (1) Commanding Officer required to set procedure in accordance with current directives.
            (a) Preparation.
            (b) Retention.
            (c) Preservation.
            (d) Disposition.
            (e) Approve log daily.

(2) Navigator.
   (a) Review log daily.
   (b) Enter data required in spaces provided.
   (c) List name and address of each officer and next of kin.
   (d) Sign log.

(3) Officer of the Day.
   (a) Make entries.
   (b) Sign name and rank after each watch.

d. Errors, additions, or omissions.
   (1) No erasures.
      (a) A single line through error initialed by person so doing.
      (b) Make correct entry.
   (2) Additions.
      (a) Any change or addition entered at bottom of page.
   (3) Omission.
      (a) Any omission will be entered at bottom of page.
   (4) Let trainees check current log for errors.

SUMMARY

We now have a basis for logs and the methods of preparing, preserving and responsibilities for most logs.

TITLE
Message Preparation

OBJECTIVE
1. Familiarize trainees with proper message format.
2. Stress upon trainees the reason for standard format.

REFERENCES
1. CG-233 Communications Manual

TRAINING AIDS
1. Blackboard and chalk.

INTRODUCTION
There are times when you will be required to take a message by telephone or radio, putting down the information in standard form to insure there are no mistakes and the person in charge will be able to read information as received and be able to take necessary action - without the necessity of chasing the man down who received the message.

PRESENTATION
1. Standard message consists of three parts. (Give examples of each one as described.)
    a. Heading, text, and ending.
        (1) Heading
            (a) Procedure and method
            (b) Preamble (precedence, date time group)
            (c) Address (from, to, info)
            (d) Prefix (group count)
    b. Text (Give example).
        (1) Subject of message.
            (a) All between the two BT's.
    c. Ending.
        (1) Procedure (Give example of each).
            (a) Wait, over, out.
            (b) Time of delivery (TOD).
            (c) Time of receipt (TOR).
            (d) Receiver's initials.

2. Demonstrate complete message on blackboard. Have class define sections.

SUMMARY
Heading (address) - Text (actual message) - Ending (sign off-TOD-TOR)

TITLE

Communications and signaling

OBJECTIVE

To familiarize the trainees with the proper methods of signaling, the different mathods of communications and the commonly used pro-words along with how to use them.

REFERENCES:

1. Coast Guardsman's Manual

TRAINING AIDS

1. Blackboard and chalk.
2. Paper and pencil (required for each trainee).

INTRODUCTION

Visual communications are needed to pass messages between all units without using radio telephone. During wartime need of publications to code or decode messages, to prevent enemy units from forseeing our intentions.

PRESENTATION

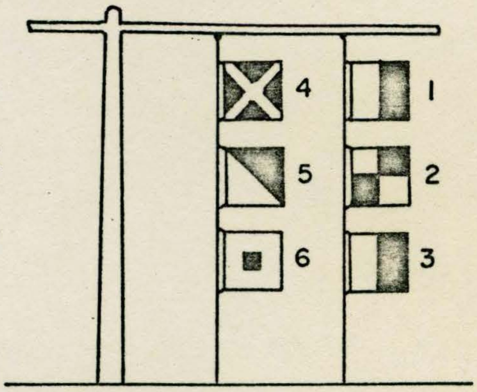
1. Means of delivering a message.
    a. Physical delivery.
        (1) Most secure method.
        (2) Relieves congestion on electronic equipment.
        (3) Types.
            (a) Courier.
            (b) Mail.
    b. Sound Communications.
        (1) Sound, whistle and siren (used in Rules of Road).
    c. Electrical/electronic.
        (1) Radio telegraph (CW).
        (2) Radio teletype (RATT).
        (3) Radio telephone (R/T).
    d. Visual signals.
        (1) Flashing light (blinker).
        (2) Flaghoist.
        (3) Semaphore

2. Flashing light (give examples for each of following).
    a. Directional (from one unit to another).
        (1) Send call of ship being called.
            (a) Continue until receiving prosign "K".
            (b) Send the prosign "DE" and then your call sign.
            (c) Send message group by group.
    b. Common prosigns - explain uses of each.

(1)	K	- Over		(5)	WA	-	Word after
(2)	IMI	- Repeat		(6)	WB	-	Word before
(3)	AB	- All before		(7)	DE	-	This is
(4)	AA	- All after		(8)	R	-	Roger
				(9)	BT	-	Break

3. Flag Hoist.
   a. Definitions.
      (1) Close up - Hoist up to top (two blocked).
      (2) At the dip - Hoist approximately 3/4 way up.
      (3) Signal - Flag or combination of flags imparting a signal meaning or action.
      (4) Display - All hoists.
   b. Order of reading displays.
      (1) Outboard down - inboard down.

EXAMPLE



   c. Ship receiving signal.
      (1) Hoist is readable - your display same as the other, at the dip.
      (2) Acknowledge (close up).
         (a) You understand message.
         (b) Will comply.

4. Semaphore.
   a. Use of arms for signaling.
5. Visual responsibility.
   a. Every ship is responsible for relay of visual traffic for ships beyond and away from originator (see example).

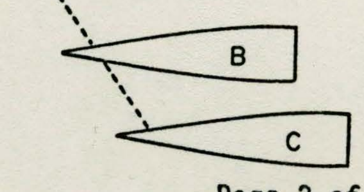
"A" has message for "C".

"A" signals "B"

"B" relays to "C"

SUMMARY

Ways to deliver a message are: physical, telecommunication, electrical and visual. Nine different common prosigns. The definition of a flag hoist and visual responsibility.



TITLE

Lookout

OBJECTIVE

To familiarize personnel with lookout duties.

REFERENCES

1. Search and Rescue Manual, CG-308.
2. Coast Guardsman's Manual.

TRAINING AIDS

1. Blackboard and chalk
2. Binoculars
3. Goggles (variable density)

INTRODUCTION

No machine built by man can be said to be fully reliable. Since the radar can miss targets, we need lookouts who have been properly trained. The eye is not affected by mechanical or electrical defects as would electronic equipment would be.

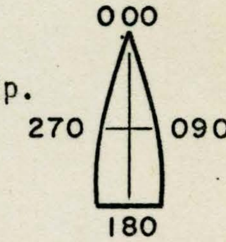
PRESENTATION

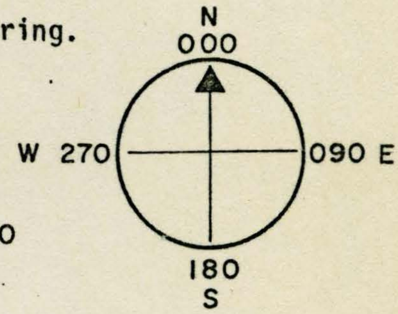
1. Lookouts required by law.
2. Importance of lookouts.
   a. Radar subject to errors and failures.
      (1) Some targets won't be picked up, others can't be identified.
      (2) Machines can fail at any time and in many ways.
   b. The eye is not subject to failure.
      (1) Used correctly it is a sensitive instrument.
      (2) Can identify targets.
      (3) Can spot targets that radar will not or cannot pick up - such as fish boats, liferafts, etc.
   c. Using the eyes.
      (1) Daytime lookout.
         (a) Search aft forward in 10° to 15° steps.
         (b) Use variable density goggles in bright sunlight.
      (2) Night lookout.
         (a) Preparation.
            1. It takes approximately 30 minutes to completely adapt for night vision.
            2. Explain use of infra-red goggles (1/2 hour before watch and while in a lighted space).
      (3) Searching.
         (a) Horizon silhouetted or back lighted.
         (b) 10° step aft forward looking below horizon.

(4) Watches
(a) Should be rotated every half hour.
(b) Binoculars used only for short periods to prevent eye strain.

3. Relative bearings and ranges.
a. Explain difference between true and relative bearing.
(1) True - geographical
(a) 000 to 360
(b) 000 true north

(2) Relative is in relation to ship.
(a) Orientation points.
1. 000, 090, 180, 270.





b. Ranges always estimated.
(1) Lookout should know distance to horizon.
(2) Relative bearing followed by estimated range.
(a) Objects appear closer over water.
(3) Ranges over horizon for ships given as; ship bearing ________ hull down.
c. Quickness and accuracy only comes with practice.

4. Reports.
a. Target identification.
(1) Lookouts report everything seen or heard and then investigates.
(a) If not identified, report "Unidentified object - bearing and range".
(b) For a light or buoy, report color, type, and characteristics and number, if possible.
(2) Reports in general.
(a) Reports to be as exact as possible.
(b) Repeat all reports until acknowledged by receiver.

SUMMARY

The importance of lookouts, radar failing, use of eyes, daytime lookout, night lookout and the reports.

TITLE
Helmsman and engine order telegraph

OBJECTIVE
To familiarize trainees with the duties of the helmsman and correct procedures for using engine order telegraph.

REFERENCES
Coast Guardsman's Manual

TRAINING AIDS
1. Actual helm.
2. Actual annunciator.

INTRODUCTION
During your tour in the Coast Guard nearly everyone will stand a helm watch and must be able to do so competently. The engine order telegraph must also be used with competence.

PRESENTATION
1. Helmsman duties.
   a. Lubber line represents ship movement around compass card (show by demonstration).
   b. Procedure for relieving. Receives course from man on helm. Requests OOD permission to relieve helm on course received from helmsman. When granted goes to helm.
      (1) Relieves when steady on course.
   c. Changing Course (have trainees practice).
      (1) OOD orders - COME RIGHT TO 030 (always given in three figures, example, Zero - Three - Zero)
      (2) Helmsman immediately moves helm to right and repeats order.
      (3) When on new course, reports, "STEADY 030 SIR".
      (4) OOD replies, "VERY WELL".
   d. Similar procedure (have trainees practice).
      (1) OOD orders "RIGHT TEN DEGREES RUDDER".
      (2) Helmsman puts rudder to right and repeats order.
      (3) When as ordered, report "RUDDER IS RIGHT TEN DEGREES, SIR".
      (4) OOD replies "VERY WELL".
      (5) This applies to all helm orders.
2. Engine-order telegraph (have trainees practice).
   a. Used to communicate to engine room as to speed changes.
      (1) Usual engine order telegraph has a circular face.
         (a) Has nine positions, five ahead, three astern and stop.
         (b) Ahead positions, one-third, two-thirds, standard, full and flank.
         (c) Astern positions, one-third, two-thirds and full.

(d) Commands (trainees practice).
  1. Repeat all orders, exactly.
  2. OOD orders all ahead one third.
    a. Watch moves handle to appropriate position.
    b. While repeating order.
    c. When engine room answers, report, engine room answered "ALL AHEAD ONE THIRD, SIR".
    d. OOD replies, "VERY WELL".

3. Bell signal system - used when engine-order telegraph fails.
  a. Signals.
    (1) One bell - slow ahead.
    (2) Two bells - stop.
    (3) Three bells - slow astern.
    (4) Four bells - full, in direction shaft turning.

SUMMARY

Remember to repeat all orders as given and report when completed and procedure for relieving helm.

TITLE

Sound powered phones.

OBJECTIVE

To acquaint the trainees with theory, care, use of sound powered phones, procedures and pro-words.

TRAINING AIDS

1. Sound powered phone headset.
2. Sound powered phone handset.
3. Blackboard and chalk.
4. Sound powered phone circuits on board the ship.

REFERENCES

1. Instruction Booklets as available in Unit's library.

INTRODUCTION

Until recently the only means of communicating between stations aboard a vessel was by messenger and as such could be stopped at some point. A system was developed to rapidly and accurately pass messages and be independent of electrical power. This system is the sound powered phones.

PRESENTATION

1. Theory.
   a. No electrical power source.
   b. Powered by sounds such as voice, motor pumps, guns and so forth.
   c. Sounds hit a diaphram causing it to vibrate generating a small amount of current.
   d. The current is carried through the wire to an earpiece which reproduces the sound.
2. Care.
   a. When handling (demonstrate each item).
      (1) Never dangle leads or have weight of phones on them.
      (2) Put on headset before plugging onto jack box.
      (3) Adjust ear phone correctly.
      (4) Insert plug straight. Hold plug and tighten collar.
      (5) Do not walk on or close doors or hatches on the leads.
      Explain possibility of breaking leads.

3. Use.
   a. Selection of talkers.
      (1) Speech defects or pronounced accents should not be used as talkers.
      (2) Talkers should be able to repeat short phrases word for word by memory.
   b. Use of phone (demonstrate correct way and have trainees practice).
      (1) Call circuits.
         (a) Use appropriate buzzer.
         (b) Hand set only.
         (c) Press button to talk and listen.
         (d) Answer phone with name of station, "aye" and their own name.
      (2) Manned circuits (demonstrate correct way and have trainees practice).
         (a) Headsets only.
         (b) Press mouthpiece button to talk and release to listen.
         (c) Report when phones are manned, example, repair party on the line.
         (d) Speak slowly, clearly and distinctly. Do not yell.
         (e) Have the ear free nearest the man controlling the station.
      (3) Talkers should.
         (a) Have paper and pencil at all times to ensure exact word for word relaying.
         (b) Send only official messages.
         (c) Send messages from man in charge of station only.
         (d) Pass all messages word for word.
            1. Changing of one word can completely change message.
         (e) Use standard procedure and circuit discipline.
         (f) Check communications after sustaining any damage which might affect phone circuits.
         (g) Phone talkers become messengers in the event communications are lost.
         (h) Keep wire out of passageways (to prevent tripping).
      (4) Securing phones (demonstrate each step with one or two trainees doing it at the same time).
         (a) Remove the plug and cover jack box before removing headset.
         (b) Hang head piece on the yoke, coil phone lead in 8-12 inch coils. Do not drag or bounce the plug, walk toward it while coiling or place plug in pocket.
         (c) Remove head piece from yoke and place mouth piece against chest plate.
         (d) Marry the coil of wire to the head piece and wrap two or three times and fasten clip.
         (e) Hang phones or place them in phone box, stowage location must be dry and clean.
         (f) If phones do not work properly, notify electrician.

4. Procedures.
   a. Standard transmission consists of station called, station calling and the text.
      (1) Example - engine room - bridge - pump bilges.
   b. Person in charge should give entire message including station called - station calling. Therefore, the message should be as short as possible.
   c. Acknowledgement.
      (1) Given only when message has been received.
         (a) Name of station and "aye, aye".
         (b) Meaning, "I hear and will take necessary action".
         (c) Does not answer a question or grant permission.
      (2) If message is not acknowledged for, say it again.
      (3) Demonstrate a complete correct message and have trainee practice sending messages.
5. Standard phrases (pro-words).
   a. Say again - said alone means last transmission is to be said over.
   b. Repeat back - used after call to have message said back for verification.
   c. Wait - given when answer not readily available.
   d. Silence - by controlling station to silence all talkers for an important message.
   e. Silence on the line - by any station other than controlling station to silence talkers.
   f. Correction - my last transmission in error - followed immediately with correct message.
6. Long messages.
   a. When messages are long, break into short messages.
      (1) Example - bridge - repair party - large class A fire in compartment A-202-A / bridge - repair party - fire boundaries set at bulkheads 10 and 20 / bridge - repair party investigating all surrounding compartments.
      (2) Gunnery circuits break at convenient intervals to allow receiving station to repeat exact message with button depressed, to eliminate error.
      (3) Emergency steering.
         (a) Rudder commands repeated at each station with button depressed.
         (b) Rudder indications repeated at each station with button depressed.
         (c) Demonstrate correct way and have trainees practice.

SUMMARY

Standard transmission - station called - station calling - message.
Standard phrases - say again - repeat back - correction - silence - silence on the line - wait.
Word for word transmission and relay.

NUMBER B004

TITLE
Radio Telephone Procedures

OBJECTIVE
To familiarize the trainees with procedures, use of correct prowords and procedures for distress traffic.

REFERENCES
1. Coast Guard Communication Manual, CG-233

TRAINING AIDS
1. Blackboard and chalk.
2. Actual equipment.
3. Handout of prowords.

INTRODUCTION
In the Coast Guard and especially on small units and bases nearly anyone can be called upon to send or receive a message by voice radio.

PRESENTATION
1. Purpose is to intelligently transmit and receive messages.
   a. Effectively handle traffic with no delay.
   b. Utilize other ratings than RMs.
2. Handset position (demonstrate).
   a. 1/2" to 1" from mouth.
   b. Positioned directly in front of mouth.
3. Manner of speech (trainees practice).
   a. Less than rate of normal conversation.
   b. Pronounce each word correctly.
   c. With aircraft, send even slower.
4. Initial call (trainees practice).
   a. Unit called, "this is", unit calling.
   b. Include frequency being used.
   c. Followed by proword "over" or "test", as required.
   d. Acknowledgement is reverse process.
5. Message format (place on blackboard and have trainees practice).
   a. Precedence.
   b. Date and time group.
   c. Addresses (for action - for info).
   d. Break.
   e. Text.
   f. Ending.

6. Abbreviated voice radio log (place on blackboard).
   a. Should contain the following.
      (1) Date, time, group.
      (2) From.
      (3) To.
      (4) Frequency.
      (5) Abbreviated text.
      (6) Operators signature and rank or rate.
7. Pronounciation (have trainees practice).
   a. Numbers.
      (1) One - Wun
      (2) Two - Too
      (3) Three - Thuh-ree
      (4) Four - Fo-wer
      (5) Five - Fi-yiv
      (6) Six - Six
      (7) Seven - Seve
      (8) Eight - Ate
      (9) Nine - Niner
      (0) 0 - Zero
   b. Spelling.
      (1) Use phonetic alphabet.
8. Prowords (have copy made for handout to trainees if possible). (attached sheets)

SUMMARY

We now have a basic knowledge of preparing, sending and receiving messages by radio telephone - How it is made up and the use of prowords.

PROWORD	EXPLANATION
Acknowledge	Let me know that you have received and understand this message.
Affirmative	Yes or Permission granted.
All After	The portion of the message to which I have reference is all that which follows ______________.
All Before	The portion of the message to which I have reference is all that which preceded ______________.
Break	I hereby indicate the separation of the text from other portions of the message.
Cancel	Cancel my transmission ______ (DTG or transmission identification) (Not to be confused with Proword "Disregard this transmission".)
Correction	An error has been made in this transmission. Transmission will continue with the last word correctly transmitted.
Disregard This Transmission	This transmission is an error. Disregard it. (This proword shall not be used to cancel any message that has been completely transmitted and for which receipt or acknowledgement has been received.)
I read Back	The following is my response to your instruction to read back.
I Say Again	I am repeating transmission or portion indicated.
I Spell	I shall spell the next word phonetically.
I Verify	That which follows has been verified at your request and is repeated. (To be used only as a reply to VERIFY.)
Message Follows	A message which requires recording is about to follow. Transmitted immediately after the call.
Negative	No or Permission not granted or That is not correct.
Number	Station serial number.
Out	This is the end of my transmission to you and the answer is required or expected.

PROWORD	EXPLANATION
Over	This is the end of my transmission to you and a response is necessary. Go ahead, transmit.
Go Ahead	Proceed with your message.
Read Back	Repeat all, or the specified part, of this message back to me exactly as received.
For	Transmit this message to all addressees or to the address designators immediately following.
Relat (to)	Transmit this message to all addressees or to the address designators immediately following.
Roger	I have received your last transmission satisfactorily.
Say Again	Repeat all or the following part of your last transmission.
Silence	Cease transmission immediately. Silence will be maintained until instructed to resume.
Silence Lifted	Silence can be lifted only by the station imposing it or higher authority.
Speak Slower	Your transmission is at too fast a speed, reduce speed of transmission.
Standby	Self explanatory.
That is Correct	You are correct, or what you have transmitted is correct.
This is	This transmission is from the station whose designation immediately follows.
Time	That which immediately follows is the time or date-time group of the message.
Unknown Station	The identity of the station with whom I am attempting to establish communication is unknown.
Verify	Verify entire message (or portion indicated) with the originator and send correct version. (To be used only at the discretion of or by the addressee to which the questioned message was directed.)

PROWORD	EXPLANATION
Wilco	I have received your message, understand it and will comply. (To be used by the addressee. Since the meaning of ROGER is included in that of WILCO the two prowords are never used together.)
Wait	I must pause for a few seconds.
Wait Out	I must pause longer than a few seconds.
Word After	The word of the message to which I have reference is that which follows ______________.
Word Before	The word of the message to which I have reference is that which precedes ______________.
Words Twice	Communication is difficult. Transmit (ing) each phrase (or code group) twice. (This proword may be used as an order, request or as information.)
Wrong	Your last transmission was incorrect. The correct version is ______________.

TITLE
General Quarters and General Emergency Procedures

OBJECTIVE
To instruct the trainee in procedures required of all hands when proceeding to and manning General Quarters and General Emergency stations.

REFERENCES
1. Coast Guardsman's Manual
2. Own Ship's Organization and Regulations Book, CG-260 series

TRAINING AIDS
1. Watch, Quarters, and Station Bill
2. Pencils and paper

INTRODUCTION
The initial procedures for preceeding to General Quarters and General Emergency are basically the same. The material in this lesson is required by all hands for all of these emergencies. They provide for efficiency and safety in proceeding to and manning the stations. Your lives may depend upon following them.

PRESENTATION
1. Watch, Quarter, and Station Bill (use own ship's bill).
   a. Review emergencies on bill.
   b. Have each man note and write down his own assignments.
2. General Quarters and General Emergency basically same for initial procedures.
   a. Usually have advance warning for going to General Quarters.
   b. General Emergency occurs unexpectedly in peacetime, no advance preparation.
3. Action on receiving word.
   a. Sound general alarm.
   b. Announce by PA or word of mouth, including type of emergency (battle stations, condition I (II, III), fire, collision, etc.) and general location, if known (forward, amidship, aft, port, starboard).
   c. All hand pass word.
4. All hands immediately move quickly to stations.
   a. Delays may mean loss of lives and/or ship.
   b. Use caution. Don't be careless when moving.
   c. Normally, where configuration of ship permits, movement forward and up is along starboard side. Movement aft and down is along port side.

5. Upon arriving at station
   a. Establish communications immediately.
   b. All topside personnel don lifejackets. Other have lifejackets immediately available.
   c. Donning of lifejackets to be done as soon as possible while commencing assigned duties. Do not let this delay performance of your duty.
   d. Battle dress for all hands.
      (1) Helmets only for CQ not General Emergency.
      (2) Lifejackets, as before mentioned.
      (3) Sleeves rolled down and buttoned. Collars buttoned, white hats turned down, trousers tucked into socks (boots are impractical since can act as buckets to catch hot embers, water, etc).
      (4) Basic intent to protect all possible exposed areas of body from debris, etc.
6. Set and maintain water tight integrity.
   a. Normally material condition Zebra.
      (1) Throughout ship for GQ.
      (2) Commence in vicinity of damage for General Emergency.
      (3) Permission to open closures not required for investigators, if reclosed immediately.
      (4) <u>All hand keep closures secured. Your safety is at stake.</u>
7. Report "manned", "ready", or "manned and ready", as soon as possible.
8. Unless duties require you to move, remain at your station until you are ordered to do otherwise, or the word "secure" is passed.

<u>SUMMARY</u>

Both General Quarters and General Emergency require manning stations quickly, establishing communications, getting into battle dress, setting and maintaining watertight integrity. Doing these things will protect you and may save your life, leaving you in a position to fight the emergency.

NUMBER B006

TITLE

Steering casualty procedures.

OBJECTIVE

To familiarize trainees with the procedures for steering casualty.

REFERENCE

1. Instruction material as available in unit's library.

TRAINING AID

1. Blackboard and chalk.

INTRODUCTION

Can you picture what would happen if we had an actual steering emergency and no one knew his job. We would probably end up aground. So standards are set up and must be practices to make us proficient in our jobs.

PRESENTATION

1. Initial action.
    a. Signals (bridge).
        (1) At least six blasts on ship's whistle.
            (a) Followed by one or two blasts (starboard or port).
    b. Anchor detail manned.
    c. Condition Zebra set.
    d. Breakdown flags.
        (1) Code, Lima, India, India.
            (a) Drill signal.
        (2) Code Delta.
            (a) Meaning - manuevering with difficulty.
    e. Communications.
        (1) Sound powered phones.
            (a) Manned rapidly, aft and bridge.
        (2) Radio.
            (a) Notify District Commander or Group Commander as applicable.
    f. Rigging emergency tiller.
        (1) Tackle.
            (a) Leads fair.
            (b) Blocks not tumbled.
        (2) Deck markings- accurate.
            (a) Indicate rudder angle.
            (b) Full rudder 5° less than rudder limit.

2. Action.
   a. Tiller.
      (1) Permission.
         (a) Request permission to insert tiller.
         (b) When granted, insert tiller then report tiller inserted.
   b. Symptoms.
      (1) Bridge should give symptoms to repair party - example - "Apparent Jam".
   c. Communications - verification, Orders.
      (1) Bridge - repeat orders as given.
      (2) Aft station - repeat as received.
   d. Tests.
      (1) Test aft first.
         (a) Slowly, 5° steps informing bridge of each angle.
         (b) Bridge checks to see if they coincide.
         (c) Do not force rudder (should swing fairly free).
      (2) Bridge test - tackle slack aft.
         (a) RIGHT FULL.
            (1) Aft station reports "RUDDER ANGLE".
         (b) RUDDER AMIDSHIPS.
            (1) Aft station reports "RUDDER ANGLE".
         (c) When tests are satisfactory.
   e. Securing aft.
      (1) Permission to remove tiller.
         (a) After granted, remove tiller.
      (2) Bridge pass word.
         (a) SECURE FROM STEERING CASUALTY.

<u>SUMMARY</u>

As you can see the order of events is really important, such as, type of casualty, getting ready for emergency steering, installing the tiller and sequence of tests.

TITLE
Man Overboard Procedures

OBJECTIVE
To familiarize trainees with the proper procedure for recovery of a man overboard.

REFERENCE
1. Coast Guardsman's Manual

TRAINING AIDS
1. Stokes litter
2. First aid kit.

INTRODUCTION
All Coast Guardsmen must be competent in man overboard procedures and their duties assigned, in such an emergency. They should keep in mind that the person overboard is in serious trouble; therefore, requiring immediate and effective help.

PRESENTATION
1. Passing of the word.
   a. The word, MAN OVERBOARD (PORT or STARBOARD) must be known throughout the ship.
   b. Leave no compartment/department unaware of the emergency.
2. Ship signals.
   a. Six (6) or more short whistle blasts.
   b. Break Oscar flag.
3. Ship's turn.
   a. Williamson turn (60° right or left of the original course and then full right or left rudder to a reciprocal course).
   b. Destroyer turn (180°) full speed and full rudder-close to within ten yards of man.
   c. Approach across and up-wind from the man.
4. Method of pick-up.
   a. Ship pick-up or small boat pick-up.
   b. Rig scramble net or jacobs ladder.
   c. Scene leader can order swimmer onto net, but swimmer does not go into water until word is given from the bridge.
5. Survival equipment.
   a. Throw liferings, lifejackets or anything that will float, if liferings are not available.
   b. At night, be sure that they are lighted.

6. Ready swimmer(s) in tending harness and lifejacket.
   a. Harness put on under lifejacket.
   b. Swimmer(s) must be experienced and effective.
7. Take muster.
   a. As time permits, make report to bridge. This is required.
8. Shark watch.
   a. Shoot to kill the shark.
   b. Be situated in area where full view of water can be observed.
   c. Use shark repellent if available.
9. Pointer.
   a. Station a pointer where he will have a good view and can be easily seen from the bridge.
   b. A search light detail at night.
10. Provide Kapok heaving lines.
    a. Never less than two.
    b. Do not throw until in range of man in water.
    c. Keep throwing until you have man alongside.
    d. Never use a boat hook.
11. Provide First Aid equipment.
    a. First aid kit.
    b. Blankets.
12. Lowering of stokes litter.
    a. Point the litter foot first toward swimmer and lower litter so that swimmer may slide victim onto litter easily.
    b. Strap victim in, using at least one of the straps.
    c. Hoist victim up onto deck.
    d. Swimmer remains in water until injured man is safely on deck.
13. Provide means of lifting injured man up onto deck.
    a. Stokes litter with floatation gear, four tending lines and two straps to tie man in.
14. Giving First Aid.
    a. Scene leader organize men on deck and direct administering First Aid to injured man.
    b. Keep bridge informed of condition of injured man (original injuries and accomplishments through First Aid).

SUMMARY

The word MAN OVERBOARD must be passed throughout the entire ship. Other vessels in the immediate area must be alerted by proper signaling of the ship's whistle and flag. Liferings should always be kept in the place provided and all hands should be aware of their location. If you are a pointer, be sure you see the victim and not another floating object. First Aid is a very important factor in this emergency. Be sure to commence First Aid as soon as the injured is brought aboard. Commence mouth to mouth resuscitation without delay, when required.

/ NUMBER B008

TITLE

Rescue and Assistance Procedures

OBJECTIVE

To familiarize the trainees with the more important general procedures for rescue and assistance whether **providing for damage control assistance** or rescue of survivors.

REFERENCES

1. Own ship's Organization Book and Regulations Book, specifically Rescue and Assistance and SAR Section.

TRAINING AIDS

None

INTRODUCTION

Every ship provides rescue and assistance facilities for persons and units needing it. Rescue and assistance covers recovery of personnel, which is basically the man overboard procedures, and damage control assistance in the form of a mobile repair party. Only the basic procedures for providing these facilities will be covered in this lesson. Details of damage control, resuscitation, first aid, search and rescue, etc., are in other lessons. Only differences will be covered for now.

PRESENTATION

1. Purpose of rescue and assistance.
    a. Aiding other ships in distress-fire or flooding.
    b. Assisting shore facilities in firefighting or during other emergencies such as hurricane, earthquake, etc.
2. Equipment requirements.
    a. Basic equipment (get together and check - staging of equipment).
        (1) Transportation.
            (a) Boat.
            (b) Vehicle.
            (c) Carry on foot.
        (2) Equipment.
            (a) Pumps, hoses.
                1. Fire pump - largest available and possible.
                2. Salvage pump - largest available and possible (no submersible due power requirements).
            (b) Access kit.
            (c) OBA's and tending equipment.
            (d) First aid kit.

(3) Portable communications equipment (as available).
    (a) Signal flags.
    (b) Portable radio.
    (c) Emergency sound powered phone (X40J).

b. Additional equipment (men and equipment as available)
    (1) Overhaul equipment.
    (2) Plugs and wedges.
    (3) Pipe patching kit.
    (4) Emergency cutting equipment.
    (5) Emergency lighting.

3. Procedures.
    a. Obtain information (location, type of incident, personnel and equipment available and desired, what communications equipment is available).
    b. Stage equipment and personnel.
        (1) All men qualified - boat coxswains, government vehicle drivers, OBA men, party leaders, etc.
        (2) Re-check staging - check out communications, set communications schedule, if appropriate.
        (3) Organization of party in accordance with Organization Book.
        (4) Maintain shipboard watch - underway or in port.
        (5) OOD/CO dispatch party. Recheck communications enroute.
        (6) Party leader analyze and report situation. Continue regular reports, as possible, additional support may be necessary.

4. Rescue of Survivors.
    a. Single survivor in water - man overboard procedures followed.
    b. Many survivors in water.
        (1) Use of man overboard equipment, including boat(s).
        (2) Hot coffee, soup, food, etc.
        (3) Berthing - all that is available.
        (4) Blankets and clothing, all available - even personal.
        (5) Medical - most qualified personnel.
            (a) Separate berthing for injured.
        (6) Cleaning facilities.
        (7) Women and children.

<u>SUMMARY</u>

Rescue and assistance requires the use of common sense. There can be no set procedures since the situations are so varied. In the case of rescue of personnel, use the maximum capabilities of the ship in regard to man overboard procedures. In the case of assistance, all of your damage control knowledge must be used. The primary mission of the Coast Guard is the safety of life and property at sea. Maintain our own ship ready to perform this mission. If it comes to a choice, the gains must be weighed against the possible losses. Do not unnecessarily endanger yourself or your shipmates. Know your job and do it.

NUMBER B009

TITLE

Abandon Ship Procedures

OBJECTIVE

To familiarize trainees with the basic steps for the preparation in abandon ship, the proper method of leaving the ship and to stress the importance of care of the abandon ship equipment and materials.

REFERENCES

1. Coast Guardsman's Manual

TRAINING AIDS

1. Blackboard and chalk.
2. Lifejacket Kapok type.

INTRODUCTION

In the past, major disasters at sea showed us the need for organization in abandon ship procedures to prevent needless loss of life. In these disasters, had the crews been sufficiently trained in the correct procedures the loss of lives would not have been so high.

PRESENTATION

1. Phases.
   a. Phase I.
      (1) Command - ALL HANDS PREPARE TO ABANDON SHIP.
          (a) Action.
      (2) Equipment necessary for best chances of survival are provided.
      (3) All attempts to remain afloat being carried out.
      (4) Secure boiler to prevent explosion.
      (5) Complete muster of personnel.
      (6) Emergency destruction of classified material designated by Commanding Officer.
   b. Phase II.
      (1) Command - ALL HANDS, EXCEPT SECURING AND SALVAGE DETAIL - ABANDON SHIP.
          (a) Action.
      (2) All personnel except securing and salvage detail depart vessel immediately.
          (a) Lower rafts and climb down into them.
          (b) Climb down into water.
          (c) Jump only if you have to (demonstrate proper jump).

- (3) Rafts lay off and standby to remove securing and salvage detail
- (4) Function of securing detail.
  - (a) Secure boiler and all valves.
  - (b) Set condition Zebra.
- (5) Function of salvage detail.
  - (a) Prepare vessel for salvage.
  - (b) Search vessel for personnel.

c. Phase III.

- (1) Command - SECURING AND SALVAGE DETAIL ABANDON SHIP or ALL HANDS ABANDON SHIP.
  - (a) Action
- (2) Securing and salvage detail depart vessel in rafts provided.

SUMMARY

Phase I - Prepare to abandon ship.
Phase II - All hands except securing and salvage detail abandon ship.
Phase III- Securing and salvage detail abandon ship.

NUMBER B010

TITLE

The Proper Care and Wear of the Lifejacket

OBJECTIVE

To familiarize trainees with proper wearing, care and stowage of the Coast Guard kapok lifejacket.

REFERENCE

1. Coast Guardsman's Manual

TRAINING AID

1. Coast Guard Kapok Lifejacket

INTRODUCTION

All Coast Guardsmen must be qualified on the proper wearing and stowing of lifejackets. They must also be qualified to instruct other non-military persons in its proper wearing and its safety features. The approved lifejacket is a life saving instrument.

PRESENTATION

1. Proper wearing (demonstrate by having trainee put it on)
    a. Arms first.
    b. Chest strap.
    c. Front ties.
        (1) All tight.
        (2) Tie with special knots.
    d. Neck piece.
        (1) Tight around neck (prevents neck damage).
    e. Leg straps.
        (1) Do not cross.
        (2) Have no turns.
        (3) Fasten with loop (easy removal).
2. Proper care
    a. Do not stow in damp compartments.
    b. Be sure at all times the light and whistle are intact and working.
    c. Always keep all lifejackets in A-1 condition for the safety of all hands.
3. Proper making up (demonstrate by having trainee make it up).

a. Lay jacket out on a clean dry surface.
b. Fake down leg straps and tuck into pockets.
c. Turn jacket over.
d. Fold collar down inside jacket and stick ends out through arm holes.
e. Fold securing laces/straps inside jacket.
f. Fold each chest section halfway inside jacket.
g. Fold jacket together and make two turns around it with chest strap and fasten together.

4. Proper stowage.
   a. Keep jacket stowed in dry compartment.
   b. Never make up a jacket that is wet or damp - let it dry thoroughly.
   c. Be sure light and whistle are intact and operative.

SUMMARY

Be sure on proper wearing that chest strap is tight and collar is snug. Never stow a lifejacket in a damp compartment or stow while wet. When a lifejacket is made up, make sure it is tight, having no loose ends.

TITLE
Liferaft Operation and Stowage

OBJECTIVE
To familiarize trainees with the proper operation and method of stowing.

REFERENCES
1. Manual for Operation and Maintenance of Inflatable Liferafts.
2. Coast Guardsmans Manual.

TRAINING AIDS
1. Actual Liferafts (if possible)
2. Blackboard
3. Photographs of liferafts

INTRODUCTION
When the emergency arises and it becomes necessary to abandon ship, the knowledge of liferaft operation and how it is stowed will save lives.

PRESENTATION
1. Construction.
    a. Made of neoprene coated fabric.
    b. Consists primarily of a main tube, for floatation.
2. Equipment (standard).
    a. Oars.
        (1) Three section, six foot oars, stowed in bag.
    b. Sea anchor.
        (1) Attached to bow.
        (2) To be cast overboard as needed.
    c. Towing attachment.
        (1) D rings in bow with suitable bridle.
    d. Lifelines.
        (1) Line attached to outer circumference to support persons who are not able to enter boat.
    e. Repair kit.
        (1) Patching material.
        (2) Can of cement.
        (3) Can of tetrachloride.
        (4) Soapstone.
        (5) Tirepatches.
        (6) Roughing tool.
        (7) Pliers.
        (8) Scissors.
        (9) Leak plugs and clamps.
        (10) Safety discs and washers.
3. Inflation.
    a. Initial inflation.
        (1) CO2 charges.

(2) Cross tubes and inflatable floors.
    (a) By hand pump.
b. Maintaining pressure.
    (1) Use hand pump.
        (a) Make sure to use pump marked inflator.

4. Stowing after drying.
    a. Rolling and paching.
        (1) Attach CO2 cylinders.
        (2) Deflate all sections - use vacuum if possible.
        (3) Place accessory containers in spaces assigned.
        (4) Fold bow section toward stern.
        (5) Attach CO2 release cable.
        (6) Roll leaving pull cable extending from roll.
        (7) Place in carrying case.
        (8) Close case and fasten static lines.
        (9) Place accessories and emergency equipment in false bottom and secure with nylon rope.
        (10) Close zipper.

5. Safety.
    a. Remove shoes - can tear raft.
    b. Do not inflate on deck in cold weather as material may crack.

SUMMARY

We have covered the basic equipment carried in a liferaft and the method of stowing. Remember your knowledge will save lives.

TITLE
Survival and Survival Equipment

OBJECTIVE
1. To familiarize trainees with procedures for surviving in water.
2. To familiarize trainees with procedure for survival in liferaft.
3. To show trainees the use and care of survival equipment.

REFERENCES
1. Survival at Sea.
2. Coast Guardsman's Manual.

TRAINING AIDS
1. Very pistol and Very stars (red-white-green).
2. MK 13 Mod. 0 - Day & Night distress signal.
3. Can of drinking water (1 good and 1 bad if possible).
4. Signal mirror.
5. De-salting kit.
6. Food ration pack, if possible.

INTRODUCTION
Having what is required when abandoning ship is not much good unless you know how and when to use it and use it properly. This equipment is needed to maintain and sustain life under emergency conditions and make contact with rescue units.

PRESENTATION
1. Survival in Water.
    a. Move to safe distance - about 200 yards.
        (1) Safe from suction and debris.
        (2) Safe from underwater explosion if in the correct position.
            (a) Flat on back all possible body openings out of water.
            (b) Plug remaining opening (to prevent internal damage).
    b. Keep afloat.
        (1) Kapok lifejacket best method.
        (2) Pants, shirt, pillow cases good temporary measures.
    c. Stay together.
        (1) Easier to see a group.
        (2) Help each other, especially injured persons.
    d. Predatory fish (sharks).
        (1) Remain calm and do not splash.
        (2) Stay in group if possible.
        (3) Splash only if positively attacked.
        (4) Surveys have proven sharks can sense fear as dogs do.

2. Survival in a lifeboat.
    a. Do's and dont's in a lifeboat.
        (1) Do maintain a watch.
        (2) Do rest as much as possible.
            (a) To conserve energy.
        (3) Do keep up morale and the will to survive.
            (a) The will to survive is the biggest single factor.
        (4) Do not over exercise.
            (a) You burn energy.
            (b) You lose moisture (sweat).
    b. Rations.
        (1) Food (after 24 hour period).
            (a) Follow instructions on pack.
            (b) Will last five days with raft at rated capacity.
            (c) Eat fish and sea birds only as last resort. They are high in protein.
            (d) Any sea mammal, seal, porpoise, may be eaten raw.
            (e) Average man starves to death in thirty-three days.
        (2) Water (Do not drink salt water).
            (a) 16 ozs. per man per day after first 24 hour period.
            (b) De-salting kit will make 18 ozs. eight times.
            (c) Canned water will last for five days at a rated raft capacity.
            (d) Last 10 ozs. can be used to wet lips and mouth area under tongue.
            (e) Average man will die in seven days without water - ten to thirteen days if water enough to wet lips and area under tongue.
            (f) Catch rain anyway you can. Stow in cans or inflatable raft floors.
        (3) Beached in a remote area.
            (a) Berries - if birds eat them, you can.
                (1) No birds - taste, if bitter, do not eat.
            (b) Fresh water - if animals use it or it runs for a considerable distance over rocks or sand it is considered safe.
3. Signals (<u>can be used as separate lesson</u>).
    a. Survivors
        (1) Very pistol and stars (do not use shotgun ammo).
            (a) Very pistol (stress pistol <u>dangerous</u>).
                <u>1</u>. Handle as a gun.
                <u>2</u>. Hold at 45° angle wind at back.
                <u>3</u>. Misfire, try to fire 2 more times.
                    <u>a</u>. Wait 30 seconds.
                    <u>b</u>. Unload, check primer - if dented, discard, if not, get different pistol.

b. Very stars and identifying marks (can be separate lesson).
   (1) Red - Survivor color - 200 candle power effective bar in crimped end.
   (2) White - 200 candle power effective one bump in crimped center end.
   (3) Green - Searching vessel - 200 candle power effective smooth in crimped end.
   (4) Order to be used as stated. Red first.
   (5) Visible 2 to 4 miles.

c. Day - night distress signal (can be separate lesson).
   (1) Day signal - orange band.
      (a) Wind at back.
      (b) Makes internation orange smoke about 20 seconds.
      (c) Visible 2 to 20 minutes depending on wind.
      (d) If flames on ignition.
         1. Dip momentarily to get smoke.
      (e) Visible 2 to 4 miles.
   (2) Night signal - Red band - row of bumps around end of can for night identification.
      (a) Red flare - 3000 candle power.
      (b) Burns 18 to 20 seconds.
      (c) Visible 2 to 6 miles.
   (3) Ignition both ends (demonstrate - do not ignite).
      (a) Bend D ring to edge of can.
      (b) Place D ring between thumb and forefinger, twist against lip of can.
      (c) When seal broken grasp D ring and pull sharply. Keep signal away from body to prevent getting burned during ignition.

4. Fluorescent dye marker - Green.
   a. Used for attracting aircraft primarily.
      (1) Can of orange powder.
         (a) Open can and trail behind raft.
         (b) Turns bright green on contact with water.
         (c) Put powder in rag and trail behind raft, will last longer.
         (d) Best signal when used with day smoke.
         (e) Visible 20 minutes to 2 hours, possibly longer.
         (f) Visible 2 to 6 miles.

5. Signal mirror - Best daytime signal - demonstrate.
   a. Small mirror, with aiming device and lanyard.
   b. Eight million candle power on bright sunny day.
   c. Must be aimed at search unit to be seen.
   d. Visible to 15 miles.
      (1) Visibility limited to seeing searcher to aim, under ideal conditions.

SUMMARY

Move to a safe distance from the ship. When in a life raft, maintain continuous watches, and conserve energy. Keep morale and will to survive high. Do not drink salt water and only drink 16 ozs. of water per day per man after the first 24 hours. Very signals and day/night signals are basic signalling devices. Observe safety precautions when using signalling devices and do not expend them unnecessarily. If portable radios on hand, conserve batteries.

TITLE

Boat handling.

OBJECTIVE

To familiarize trainees, especially those people who are assigned to the deck department, the type of motor boats and classes of Coast Guard boats.

REFERENCE

1. Coast Guardsman's Manual

TRAINING AIDS

1. Drawing showing parts.
2. Blackboard and chalk.

INTRODUCTION

The Coast Guard has always prided itself on smart, efficient, and seamanlike boat handling. The history of the service is full of accounts of gallant actions by small boats and their crews in peace and war.

PRESENTATION

1. Classes of motor boats.
   a. Motor lifeboats.
      (1) Three standard sizes - 36', 44', 52'.
   b. Motor self-bailing surfboats.
      (1) 25' long.
      (2) Are self-bailing and rugged.
   c. Motor buoyboats.
      (1) Three standard sizes - 40', 45' and 65'.
   d. Motor launches.
      (1) 30' and 40' long.
   e. Outboard motor boats.
      (1) Mostly under 20' long.
   f. Motor rescue boats.
      (1) 22' long.
      (2) Double ended.
2. Motor boat handling.
   a. Normal effect of rudder.
      (1) Steering wheel right or tiller moved right.
         (a) Boats head moves right.
   b. Screw turning.
      (1) Ahead - greatly increases rudder effect.
      (2) Astern - lessens rudder effect.
   c. Wind effect.
      (1) Has a great effect on boat at slow speeds.
   d. Current.
      (1) If stopped, boat will drift with current.

3. Fueling.
    a. Boats in water.
    b. Engines stopped.
    c. No passengers on board.
    d. No smoking in vicinity.
    e. Man with CO2 extinguisher standing by.
4. Safety.
    a. Crew at stations when underway.
    b. Keep crew and passengers off gunwales.
    c. No skylarking in boat.
    d. Use lifejackets.
    e. Avoid overloading.
    f. Approach docks slowly.
    g. Observe Rules of the Road.

<u>SUMMARY</u>

The most important part of a boat would be the crew and their ability, without which the boat cannot function properly or efficiently. Always remember safety is primary when using a boat or boats.

TITLE

Marlinspike seamanship

OBJECTIVE

To teach the trainee some of the fundamentals of marlinspike seamanship covering coiling and faking, knots, splicing, and blocks and tackle. wire rope will not be covered.

REFERENCES

1. The Coast Guardsman's Manual.
2. Knight's Modern Seamanship.

TRAINING AIDS

1. Length of line with sample knots pre-tied.
2. Splice examples.
3. Sufficient line for practice by trainees.
4. Fids and wooden mallets as needed.
5. Block and tackle (set used for emergency steering may be convenient).

INTRODUCTION

A knowledge of knots and splices, coiling and faking line and the power and uses of blocks and tackle will make your work easier and, in emergencies, may save lives.

PRESENTATION

1. Fiber line (rope) and cordage.
   a. Materials.
      (1) Manila.
      (2) Hemp.
      (3) Cotton.
      (4) Linen (flax).
      (5) Sisal.
      (6) Henequen.
      (7) Jute.
      (8) Man-made fiber (such as nylon, orlon, saran, drned and dacron).
   b. "Line" is most commonly used in the service, with "rope" being used to refer to wire rope.
      (1) Common kinds found on Coast Guard ships.
         (a) Manila.
            1. Most all working lines are of manila.
         (b) Hemp.
            1. Seldomly used.
            2. Commonly found in "small stuff" (ratline, marline, seizing stuff).

(c) Cotton.
1. Leadlines.
2. Heaving lines.
3. Signal halyards.
(d) Synthetic line (man-made fibers).
1. Nylon most common.
2. Used where elasticity and strength are required with resistance to heat, acids, and rot are required.
3. Towing lines, floatable heaving lines, signal halyards.

2. Uncoiling, coiling, faking, flemish.
a. Uncoiling.
(1) Right-hand laid line uncoils counter-clockwise.
(2) Start uncoiling from the center of coil whether new coil or old.
b. Coiling.
(1) Lay out on deck.
(2) Begin coiling close to where made fast.
(3) Coil clockwise.
(4) Turn coil over.
(5) Uncoil by drawing on bitter end up through center of coil.
c. Faking (pictures, pages 661 & 662 Coast Guardsman's Manual).
(1) Used when laying out line for running free (demonstrate with length of line, showing how it runs free).
d. Flemish (pictures, pages 660 & 662 Coast Guardsman's Manual).
(1) Normally used with light line on small ships and boats.
(2) Keeps bitter ends neat and ship-shape (demonstrate how to flemish a line).

3. Knots and their uses (show examples of each to trainees, demonstrate and provide each with line to practice tying these knots).
a. Square knot - general purpose for securing two ends together - won't slip (explain "Granny" knot).
b. Bowline - next to square knot is most useful. Forms an eye of any desired length which doesn't slip. Can be "thrown" to make quickly (demonstrate).
c. Sheet bend - used to bend on flags not fitted with snap hooks. Can join two ends of line or one end to an eye.
d. Clove hitch - common use is securing end of line to aspar or post.
e. Whipping - secures strands at bitter end of line to prevent fraying and unlaying.
f. Other knots (as time is available).

5. Blocks and tackle.
   a. Block consists of wood or steel, within which is fitted one or more sheaves (pulleys). (Show to trainees).
   b. Size of block determined by size of line.
      (1) Diameter of sheave (pulley) is two times circumference of line (3" x 2 = 6" for pulley for 3" line).
      (2) Size of block is three times circumference of line (3" x 3 = 9" for block for 3" line).
   c. "Tackle" is an assembly on lines (falls) and blocks for the purpose of multiplying force. (Show example and demonstrate using it).
      (1) "Reeving" is passing line through blocks and "standing part" is the part of the fall which is secured to a block and does not move through the blocks.
      (2) To "overhaul" the falls is to separate the blocks and to "round-in" is to bring the two blocks together or "two-block" them.
      (3) Tackles are designated by the number of sheaves in the blocks used to make the tackle.
         (a) "Fold" when both blocks have same number of sheaves (two-fold when two double blocks used).
         (b) "Luff" used when one block has one less sheave than the other (double luff has a double and a treble block).
      (4) General rules for multiplying force.
         (a) The number of lines leading from the block to which the weight is attached is the multiplying factor. If four lines lead from the block, one pound of pull will hoist four pounds.
6. Safety.
   a. Fiber line.
      (1) Free running.
      (2) Should wear gloves to prevent burning.
   b. Coils.
      (1) Never stand in a bight of line.
      (2) Coil smoothly to prevent knots.
   c. Knots.
      (1) Do properly, your life may depend on it.
   d. Splicing.
      (1) Can give way - insure splices are tight.
   e. Block and tackle.
      (1) Never put your hand too close to blocks.
      (2) Keep feet free of bights.

<u>SUMMARY</u>

Knots are generally used for securing lines together or to other objects. Splices are used to permanently join two lengths of line to form one longer line and eyes are made to form permanent loops in the ends of lines. Blocks and tackle multiply our strength so we may move more weight easier. Learn to use them properly and your work will be much easier.

TITLE
Ground tackle

OBJECTIVE
To familiarize trainees with the parts of an anchor and associated equipment.

REFERENCES
1. Coast Guardsman's Manual, 1964.
2. Knight's Modern Seamanship.

TRAINING AIDS
1. Blackboard and chalk.
2. Actual equipment (if available).
3. Handouts.

INTRODUCTION
Ground tackle is a term that describes all gear and equipment used in anchoring. A ship is anchored when a weight is dropped to the bottom of the stream to hold the ship in place.

PRESENTATION
1. Anchors - two types (use handouts).
   a. Stockless anchor standard for Navy and Coast Guard use.
      (1) Parts.
         (a) Ring-used to connect to chain.
         (b) Shank-used to separate chain from flukes.
         (c) Flukes-used to hold bottom.
         (d) Crown-bottom of anchor.
   b. Lightweight anchor (use handouts).
      (1) Parts.
         (a) Shackle-used to connect to chain.
         (b) Shank-used to separate chain and flukes.
         (c) Flukes-used to hold bottom.
         (d) Crown-bottom of anchor.
         (e) Stock-used to keep anchor upright.
2. Chain markings.
   a. Paint and wire.
      (1) 15 fathoms - One link either side white and one turn of wire on detachable link.
      (2) 30 fathoms - Two links eight side white and two turns of wire on detachable link.
      (3) 45 fathoms - Three links either side white and three turns of wire on detachable link.

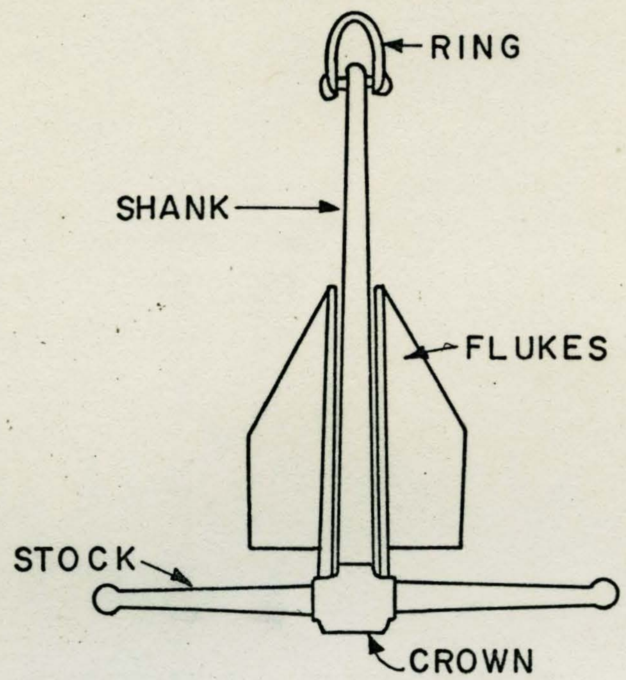
3. Care of ground tackle.
    a. Anchors, chains, and appendages should be kept in good repair.
    b. Chains should be overhauled as necessary making sure properly marked.
    c. As chains come in, inspect for cracks or other defects.
4. Winches.
    a. Basically a powered device used for hoisting.
5. Safety.
    a. Stand clear of chain.
    b. Care taken when hoisting.

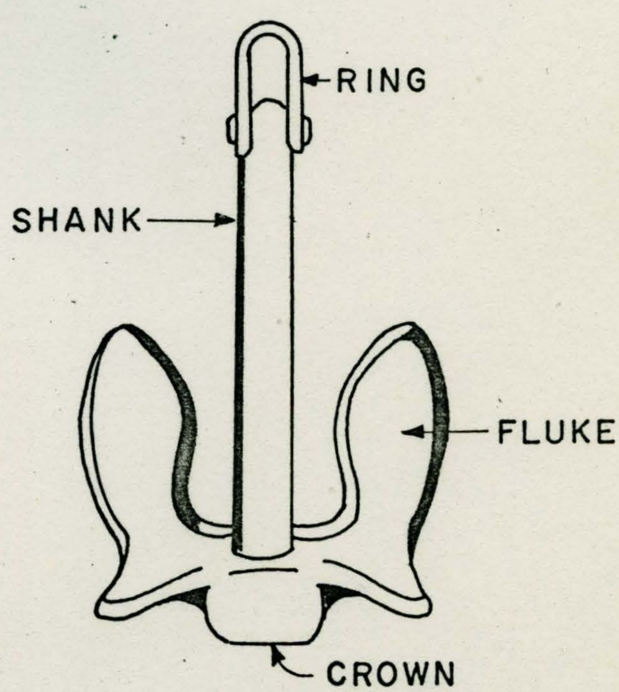
SUMMARY

Two basic types of anchors are used today, the stockless and the Navy light weight. The markings on chains are necessary for determining length. The purpose of the winch is to raise anchor. Remember safety first, always.

NUMBER B015

LIGHTWEIGHT ANCHOR
(DANFORTH)





STOCKLESS ANCHOR
(DUNN)

TITLE

Mooring lines and heaving lines

OBJECTIVE

To familiarize trainees with the mooring lines, the use of heaving lines and commands.

REFERENCES

1. Knight's Modern Seamanship
2. Coast Guardsman's Manual

TRAINING AIDS

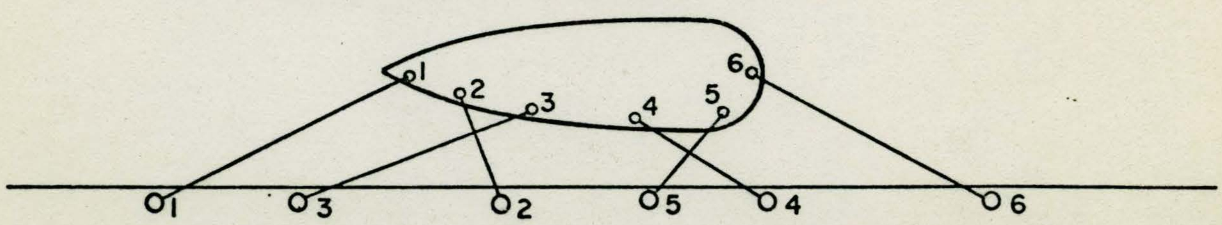
1. Blackboard and chalk
2. Heaving line

INTRODUCTION

Lines used to keep a vessel alongside the dock are called mooring lines. During this lesson we will show the different types and their uses. One means of getting the lines to the dock is with the heaving line.

PRESENTATION

1. Mooring lines and their usage.
   a. Lines are numbered from forward to aft.
      (1) Leading from bow to forward to deck.
      (2) Number two - after bow aft to deck.
         (a) Leading from bow to aft to dock.
      (3) Number three - forward bow spring.
         (a) Leading forward from bow area.
      (4) Number four - after quarter spring.
         (a) Leading aft from quarter.
      (5) Number five - forward quarter spring.
         (a) Leading forward from quarter.
      (6) Stern line.
         (a) Leading aft from stern.
      (7) Waist or breast line.
         (a) Straight out from amidships.
         (b) Must be designated by Commanding Officer.
      (8) Drawing showing lines in use (draw on blackboard). If possible, make into handout.



2. Commands and meanings - by example.
    a. Slack the bow line.
        (1) Pay out, allow to form easy bight.
    b. Take a strain on one.
        (1) Put number one under tension.
    c. Take in slack on three.
        (1) Heave in on three but don't take a strain.
    d. Ease three.
        (1) Remove tension on three by slacking.
    e. Check three.
        (1) Hold three, letting line slip as necessary.
    f. Hold two.
        (1) Take sufficient turns to prevent giving line.
    g. Double up and secure.
        (1) Run additional lines or bights as needed to make mooring secure.
    h. Single up.
        (1) Take in all lines leaving one standard part at each station preparing for getting underway.
    i. Stand by your lines.
        (1) Man the lines, ready to cast off or let go.
    j. Let go.
        (1) Slack off to allow men on dock to remove lines from cleats, bollards, etc.
    k. Take in one.
        (1) Retrieve number one after it has been cast off.
    l. Cast off.
        (1) A command to those tending lines on dock to throw off the lines.
    m. Put over one.
        (1) Put over number one as soon as possible.
3. Use of heaving lines.
    a. Primary use, to provide a means of getting mooring lines to dock.
    b. Making up.
        (1) Make two coils.
        (2) One coil to be about 12 inch loops.
        (3) Second coil to be about 6-8 inches.
    c. Throwing.
        (1) Small coil with monkey fist attached, held in throwing hand.
        (2) Large coil held in other hand.
        (3) Bitter end of heaving line attached to side of mooring.
        (4) Throw with caution, can seriously injure anyone hit by monkey fist.

NUMBER B017

TITLE

Lead lines

OBJECTIVE

To train personnel in the use, markings and reports for use with the lead line.

REFERENCE

1. Knight's Modern Seamanship.

TRAINING AIDS

1. Blackboard and chalk.
2. Actual lead line.
3. Drawing of lead line and markings (use as handout if copies available).

INTRODUCTION

All rated and non-rated personnel in the Coast Guard should know the markings of the lead line and how to report soundings.

PRESENTATION

1. Markings.
    - a. 2 fathoms - 2 strips of leather
    - b. 3 & 13 fathoms - 3 strips of leather
    - c. 5 & 15 fathoms - white cotton rag
    - d. 7 & 17 fathoms - red flannel rag
    - e. 10 fathoms - piece of leather with a hole in it
    - f. 20 fathoms - 2 knots
    - g. 25 & 35 fathoms - 1 knot
    - h. 30 fathoms - 3 knots
2. Reports and meaning.
    - a. "By the mark five" - five fathom mark.
    - b. "And a quarter five" - greater than, but not over half fathom greater than 5 fathom mark.
    - c. "And a half five" - one half fathom greater than 5 fathom mark
    - d. "Quarter less 5" - less than, but not one half fathom less than the five fathom mark.
    - e. "No bottom at 15" - no bottom at fifteen fathom mark.
3. Making a sounding.
    - a. Coil line.
        - (1) Coil in about 12 inch loops. Held in left/right hand.
    - b. Throw.
        - (1) Using wooden grip (toggle).
            - (a) Swing weight forward.
            - (b) Allow to sink.
    - c. Reading.
        - (1) Take reading on line and report.
            - (a) Line must be straight up and down.

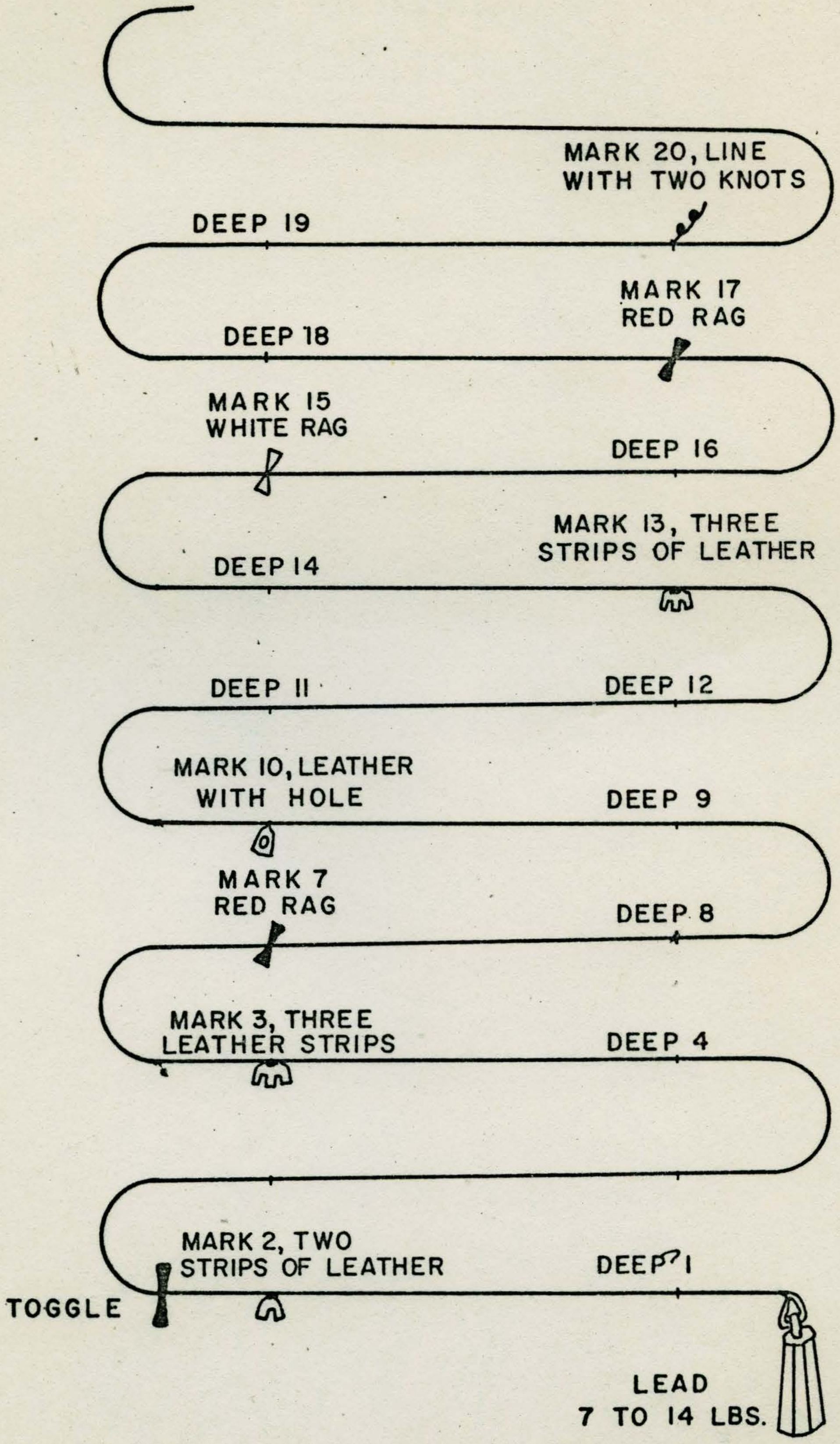
4. Drawing of lead line.
   a. Use as a handout if possible (See enclosure (1) - drawing).
5. Different types of leads.
   a. Hand held lead line.
   b. Deep sea lead.
      (1) Usually used with a winch.
      (2) Has between 30 and 100 pounds of lead.
   c. Drift lead.
      (1) Has fifty pounds of lead.
      (2) Used to see if vessel dragging anchor.
6. Safety.
   a. Weighted end deadly weapon.
      (1) Make sure area clear of personnel.

SUMMARY

The need for lead lines is important when underway in unfamiliar waters. The use of lead lines. Reports and readings must be standard. Take readings when line is straight up and down for accuracy. Become familiar with markings and what they represent. Remember it is a deadly weapon.

HAND LEAD

NUMBER B017



TITLE

Towing procedures.

OBJECTIVE

To familiarize trainees with the basic procedures for towing. Details of your own ship's procedures and equipment should be emphasized at all times, whenever appropriate.

REFERENCES

1. Knight's Modern Seamanship.
2. Own Ship's Organization and Regulation Book.

TRAINING AIDS

1. Own ship's towing gear (sample of towing hawser if whole hawser is inconvenient).
2. Blackboard, chalk, eraser.
3. Diagrams (1), (2), (3), (4), (5) (handouts if can be reproduced).

INTRODUCTION

Not using proper towing procedures has quite often led to disaster for both the towed ship and the ship doing the towing. Teamwork, quick response to commands, knowledge of what must be done, and following safety rules in handling equipment as necessary.

PRESENTATION

1. Planning.
    a. Determine equipment available on both vessels.
    b. Check and lay out equipment.
    c. Station necessary personnel - insure they know jobs. Walk-through if time available.
    d. Communicate by radio and/or megaphone.
    e. Explain towing plan to other ship.
2. Making approach (diagram (1)).
    a. Disabled vessel normally lying with wind on quarter.
    b. Determine which ship drifts faster.
        (1) Heavier ship drifts slower.
        (2) Ship with greatest area across wind drifts faster.
        (3) If drift difficult to find.
            (a) Get in line with disabled ship.
            (b) Same heading as disabled ship.
            (c) Stop and drift.
            (d) Lighter ship moves downwind faster.
    c. Assuming own ship drifts slower, check diagram (1) to see how approach is made. Approach on windward side. (Explain each section.)
    d. If own ship drifts faster, approaches are made from lee side in similar manner.

e. Safety.
   (1) Weather too bad, don't try.
   (2) Don't approach too close for conditions, avoid collision.
   (3) Keep stern clear so rudder can be used either way for hauling off in case of danger.

2. Passing line.
   a. Heaving line if weather permits.
   b. Bad weather methods.
      (1) Line-throwing gun.
      (2) Float line across. Manila floats, lifejackets, barrels, etc, may be used.
   c. Using boats.
      (1) Take crew and greater part of line.
      (2) Gets clear quickly and pays out as it approaches disabled ship.
   d. If heavy tow line needed, plan on using smaller line first, bending on a larger line, after the smaller line is on both ships, and keep on until the smaller line is strong enough to hold tow lines. These are sometimes referred to as "messenger" lines.
   e. Messenger line.
      (1) Used to pass tow lines.
      (2) Name comes from the fact that it was maintained between the two ships during all operations to pass messages back and forth. No towing strain applied. May be desirable under certain circumstances.
   f. Safety.
      (1) Never step inside the bight or loop of a line.
      (2) Stand clear of any lines having strain on them.
      (3) Don't hold lines which are running free unless absolutely necessary and then only when wearing gloves. Hands will burn. Fingers may be cut off.

3. Securing tow line.
   a. Varies considerably among vessels.
   b. Describe and explain own ship rig.
   c. Diagram (2) shows proper way to secure tow line to bits. One full turn taken before "figure eighting".
   d. Diagram (3) shows towed ship rig when the ship uses its own chain. (This method increases catenary or dip in line and provides additional "spring" to rig to absorb shock.
   e. Length of line varies according to conditions. Normally long enough that each ship will ride the tops of swells at the same time. Reduces chance of "surging" of line.
   f. Strain on line and fittings should be evened out as much as possible.
   g. Explain the use of chafing gear and pudding.
   h. Safety.
      (1) Continually check all lines for excessive strain.
      (2) Stand clear all lines with strain on them.

(3) Keep chafing gear or pudding available to replace worn stuff and avoid breading or burning line apart. Lubricant sometimes needed.

4. Getting underway.
   a. Lead out good length of tow line and make fast to both ships.
   b. Commence moving by starting as slowly as possible and slowly increasing shaft RPM until line gets taut, then stop increasing.
   c. Add few more RPM's and stopping, etc, until inertia of the tow is overcome.
   d. Increase RPM and correct course gradually as needed to final course and speed.
   e. Tow should always stay in lead ship's wake. Especially on turns, to avoid steering off.
   f. Safety.
      (1) Check for lines around stern area before moving. Might foul screw.
      (2) Continually check strain on all lines.
      (3) Station men with axes and unshackling tools on continuous watch to slip lines wuickly if necessary, must be alert.
      (4) Do not allow line to surge.
      (5) Distribute strain and adjust length of tow line as necessary.
5. Stopping.
   a. Gradually decrease speed until drifting.
   b. Cast all lines and retrieve prior to turning screw.
6. Towing alongside.
   a. Large ship towing smaller not difficult.
      (1) Insure tow is secured tight and forward.
   b. Small ship towing same size or larger ship (use diagram (4) to explain).
      (1) Position well aft. (Sketch A) on diagram (4)).
         (a) "Go Ahead" line - leads aft from towing ship's bow, snug to tow.
         (b) Backing line - leads forward from same point as "Go ahead" line to tow, snug to tow.
         (c) After breast line - from stern of towing ship straight to tow. Hold stern in.
      (2) Secure tow on port side for right hand screw. Rudder acts with rudder of tow.
      (3) Inside of tight turns. (See sketch (H) on diagram (4)).
      (4) See sketches (c) through (G) on diagram (4) for steps in winding a ship to a dock so as to reverse its direction alongside the dock.
   c. Safety.
      (1) Stand clear of lines and keep alert.
      (2) Have lines ready to cast off or axes ready for cutting in emergency.
      (3) Continually watch wind - especially with large tow.

7. Using diagram (5), explain signals. These are standard tug whistle but are suitable for all towing situations. Made by ship's whistle or mouth whistle.

SUMMARY

Towing requires the gathering of information and careful planning prior to commencement. Next follow the approach, passing of the line, securing, getting underway, stopping, and casting off. Towing alongside is easier but maneuvering is more difficult. Following safety steps closely, knowing the signals to be used, and keeping alert will mean a job well done without injury to personnel or damage to property.

DIAGRAM 1

NUMBER

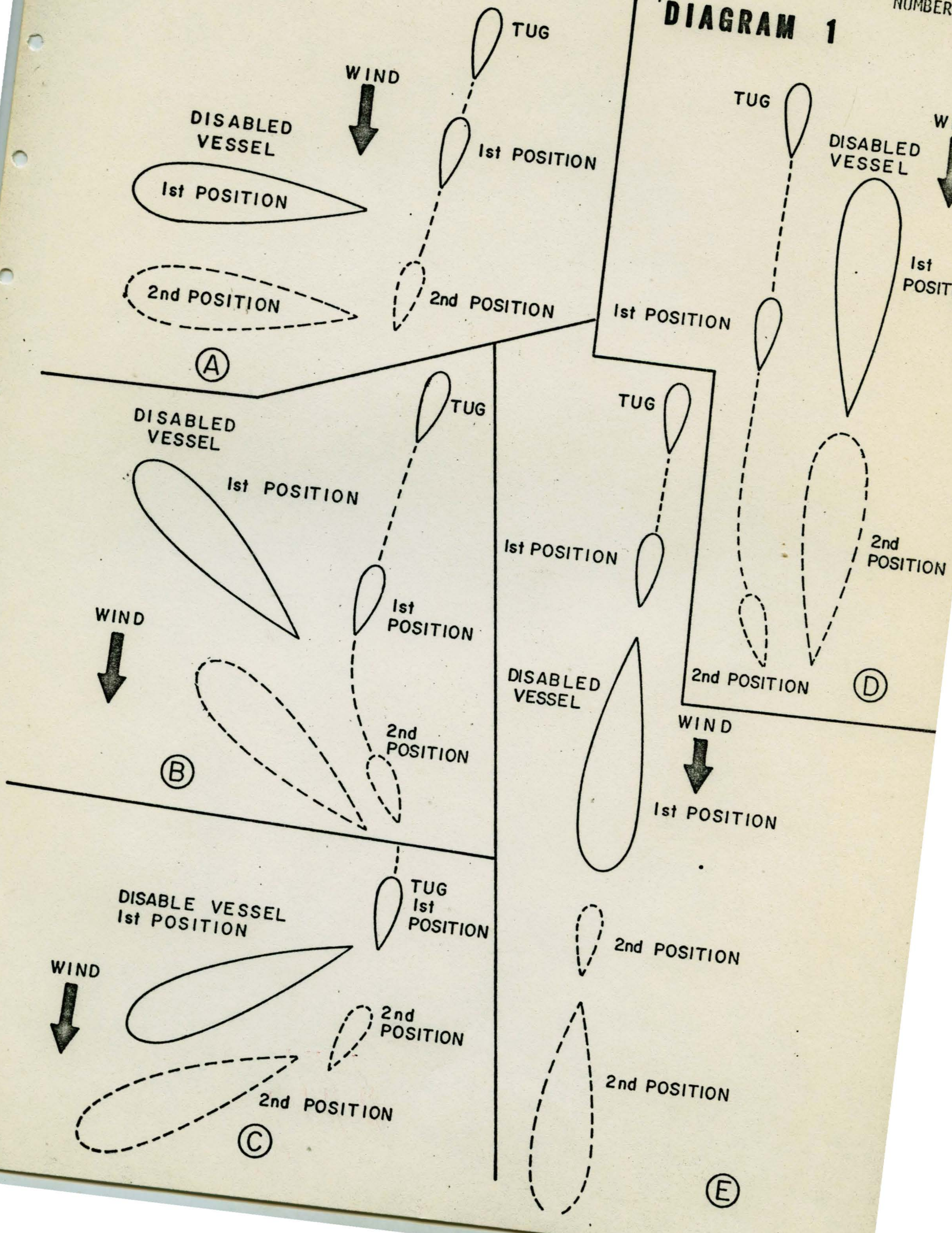
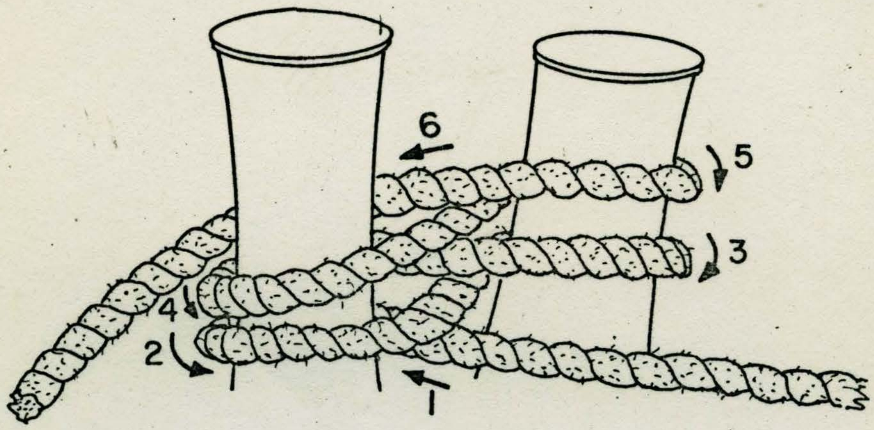
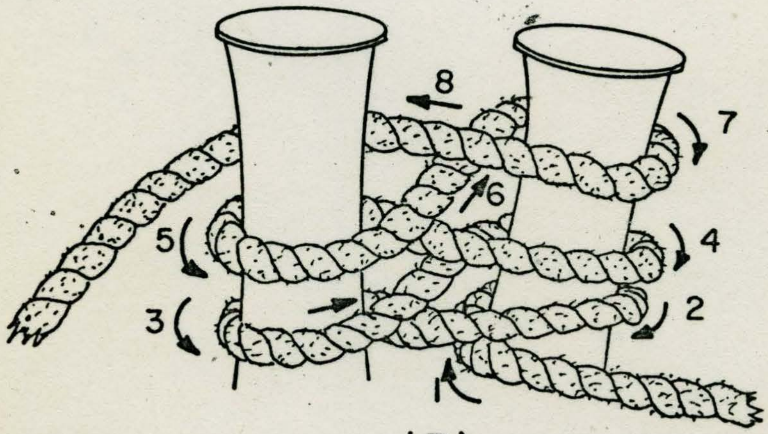


DIAGRAM 2



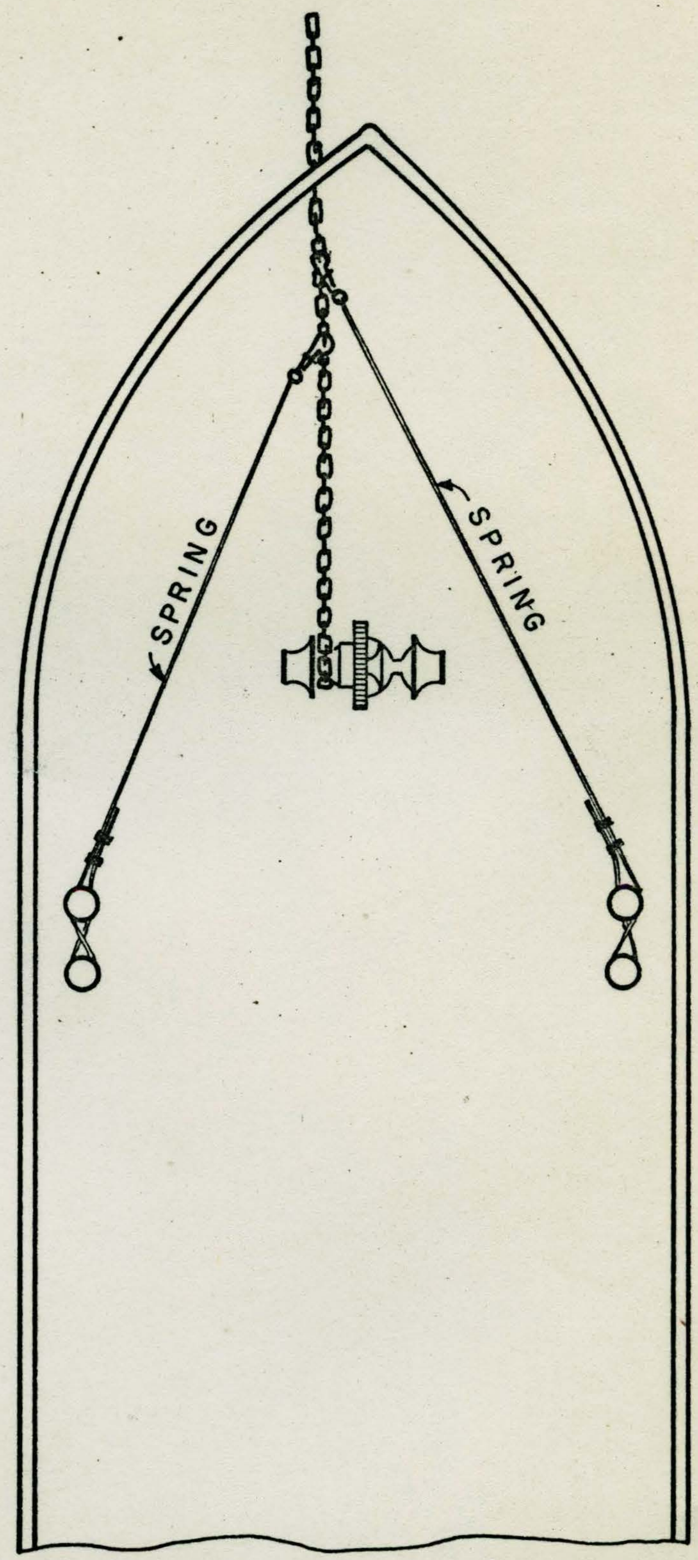
(A)
INCORRECT



(B)
CORRECT

LEAD TO TOW. TOW IS TO RIGHT.

DIAGRAM 3



BOW OF LARGE SHIP BEING TOWED USING CHAIN

DIAGRAM

CODE OF SOUND SIGNALS FOR TOWING

A short blast must not exceed two seconds in length.
A long blast must not be less than six seconds in length.

I am putting my rudder right	1 short blast
I am putting my rudder left	2 short blasts
Go ahead	2 long
Stop	1 long, 2 short
All fast	2 long, 1 short
Haul away	2 short, 1 long
Let go	2 long, 5 short
Lay out more line	1 short, 2 long
Avast hauling	3 short
I am letting go (emergency)	5 short, 5 short, 5 short

TITLE
Surface Preparation and Painting

OBJECTIVES
To acquaint the trainee with the reasons for painting and how to prepare the various surfaces he will most likely be required to paint in the Coast Guard.

REFERENCE
1. Paint and Color Manual (CG-263)

TRAINING AIDS
1. Scraper and chipping hammer.
2. Pretreatment wash primer (resin and acid).
3. Paint remover.

INTRODUCTION
Painting is an expensive procedure. Not only are paints and the related equipment expensive, but also the many manhours consumed each year devoted to painting Coast Guard ships and equipment.

PRESENTATION
1. Reasons for painting.
   a. Protection from the elements constitute the greatest single reason for painting.
      (1) Moisture causes wood to warp, swell, rot.
      (2) All things made of medal corrode.
      (3) Interior walls deterioriate due to neglect of exterior surfaces.
      (4) Provides protective film against acids, alkalies, and marine organisms.
   b. As a decorative aspect.
      (1) Art.
      (2) Science.
         (a) Pastel colors have a soothing effect.
         (b) Bright colors have a stimulating effect.
   c. Functional uses.
      (1) Sanitary measure.
         (a) Provides smooth washable surface.
         (b) Produces a healthier atmosphere than unpainted surfaces.
      (2) Reflect light.
         (a) Light colors used to reflect and distribute natural and artificial light.
         (b) Reflective quality is important to the act of camouflage.
      (3) Identification of objects.
         (a) Red - Fire fighting equipment.
         (b) Yellow - Caution signs, gas cylinders.
         (c) Green - Go signs, oxygen cylinders.

2. Preparation of steel surfaces.
   a. Sand blast only if necessary.
      (1) To remove deep rooted corrosion.
      (2) To roughen galvanized surface, not normally done, but hold nozzle at a greater distance.
   b. Wire brush galvanized surfaces.
   c. Removal of old paint.
      (1) Hand scrapers.
      (2) Hand or power wire brush.
   d. Clean with paint thinner.
      (1) Removes residual paint.
      (2) Dust and contamination.
   e. Apply liberal coat of pretreatment wash primer.
      (1) For best results apply two or three light coats rather than one heavy coat.
   f. Apply desired color and type of paint.
      (1) Number of coats depends on durability required.
      (2) Type of paint depends on the condition the surface will be subjected to.
3. Preparation of aluminum surfaces.
   a. Paint remover to remove old paint.
   b. Paint cleaner and water to remove wax contained in paint remover.
   c. Firmly adhering paint should be permitted to remain.
      (1) Loose paint and chips; remove with paint scraper.
      (2) Dull edges to prevent nicks and scratches.
      (3) Fair edges of firmly adhering paint (feathering).
      (4) Do not sand blast aluminum surface.
   d. After scraping, wash with paint thinner. Follow with water rinse.
   e. Apply desired paint.
4. Preparation of wood surfaces - new.
   a. Plane and sand to smooth finish (degree of smoothness determined by use which surface is to be placed.)
   b. Holes and cracks.
      (1) Filled with plastic wood.
         (a) If surface to be varnished or laquered.
         (b) Plastic wood can be worked after four hours.
      (2) Filled with putty.
         (a) If surface is to be painted do not use where strength is required.
         (b) Do not use on bare wood. Coat places with primer coat first, to prevent oils in putty from being absorbed into wood.
   c. Wood subjected to moisture or placed in or close to ground should be treated with wood preservative (copper - napthenate).
      (1) Pretreated wood is used where severe conditions are encountered.
      (2) Swab or brush on as much as wood will absorb.
      (3) Allow seventy-two hours drying time.

d. Partially enclosed areas such as bilges should not be painted.
   (1) Allows natural ventilation of wood.
   (2) Necessary to prevention of rot.
   (3) Wood shall be retreated when green color is gone.

5. Preparation of old and painted surfaces.
   a. Remove loose paint and chips with scrapers and/or wire brushes.
   b. Fair edges of firmly adhering paint.
   c. Wash surface with synthetic detergents.
   d. To remove oil and grease use paint thinner.
   e. Wash paint thinner with mild soap solution.
   f. Finally rinse with fresh water.
   g. Let dry, then apply desired paint.
6. Primers.
   a. Pretreatment wash primer.
   b. Red lead primer.
   c. Vinyl red lead primer.
   d. Zinc chromate.
   e. Anti-corrosive ship bottom primer.
7. Use of primers.
   a. Pretreatment wash primer; to obtain corrosion resisting surface and good paint bond on.
      (1) Aluminum.
      (2) Brass.
      (3) Copper.
      (4) Galvanized metal.
   b. Red lead primer; the standard steel primer used in Coast Guard. Composed of red lead and zinc chromate.
   c. Vinyl red lead; an anti-corrosive coating over pretreatment wash primer only. Suitable for surfaces above and below water.
   d. Zinc chromate; primer for aluminum.
   e. Anti-corrosive ship bottom; on under water steel hulls in conjunction with cold plastic anti-fouling paint.
8. Safety.
   a. Use protective equipment when using tools to prepare surfaces.
      (1) Goggles when
         (a) Wire brushing.
         (b) Chipping.
         (c) Using paint remover.
      (2) Gloves and goggles when preparing pretreatment wash primer.
      (3) Mask, gloves, and goggles when sand blasting.

SUMMARY

Without the proper surface preparation no paint job will be satisfactory. The use of primers is an important factor also. Be familiar with what primer is used on what surface.

TITLE

Watch standing (general)

OBJECTIVE

To familiarize trainees with the basic duties of persons standing watches throughout the vessel.

REFERENCES

1. Coast Guardsman's Manual.
2. Coast Guard Regulations CG-300.
3. Watch Officers Guide.

TRAINING AIDS

None

INTRODUCTION

A Coast Guard vessel or unit can never be left unattended. There must be various people on watch at all times to guard all Coast Guard property and be able to adequately take care of emergencies that might arise, including getting underway. Therefore, each man on watch must know his duties and basic duties of all others on watch.

PRESENTATION

1. Basic duties of some of the watches.
   a. Officer of the Day.
      (1) Represents Captain at all times.
      (2) Subject to orders from CO and XO only.
      (3) Responsible for carrying out ship's routine.
      (4) Sees to it that all honors and ceremonies are properly carried out.
   b. Junior Officer of the Day.
      (1) Directly responsible to Officer of the Day.
      (2) Assists Officer of the Day in carrying out ship's routine.
      (3) Relieves Officer of the Day as needed.
   c. Engineering Officer of the Watch.
      (1) In charge of ship's main propulsion plant, and associated auxiliaries.
      (2) Sees to the keeping of logs such as engineering log, bell log, and operating records.
      (3) Make sure all orders from bridge are promptly executed.
   d. Quartermaster of the Watch.
      (1) Assists Officer of the Day and Junior Officer of the Day.
      (2) Supervises the helmsman and lookouts.
      (3) Keeps bridge log such as weather, drills and etc.
   e. Lookouts.
      (1) Do nothing but lookout.
      (2) Required by law.

SUMMARY

There has always been a question in some minds as to their actual duties and responsibilities, also duties and responsibilities of other people while on watch. We now have covered some of the basic duties of some of the watches. Study in detail your own watch, so you can perform your duties to the best of your abilities.

NUMBER C001

TITLE
Rules of the Road

OBJECTIVE
To familiarize trainees with basic rules of the road.

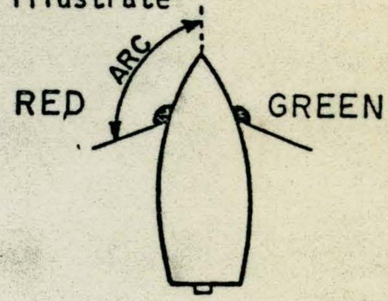
REFERENCE
1. CG-169, Rules of the Road, International and Inland

TRAINING AID
1. Blackboard and chalk.

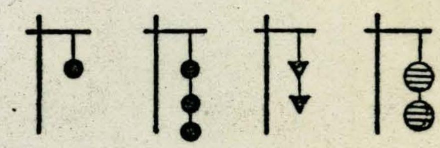
INTRODUCTION
It is imperative for all personnel to be familiar with basic rules of the road. You can never tell when the knowledge you learn today will be put to practical use.

PRESENTATION

1. Lights and shapes. (Use the blackboard or poster to illustrate each item.)
   a. Side lights - (cro-sing or meeting situation)
      (1) Red - portside.
      (2) Green - starboard side.
      (3) Red and green - ship heading toward you.



   b. Stern light.
      (1) White.
      (2) Not seen on the beam of a target.
   c. Mast head light (forward).
      (1) White light.
      (2) Vessels over 150' long show additional light.
      (3) Higher and aft of first light.
   d. Shapes.
      (1) One black ball - anchored.
      (2) Three black balls vertical - aground.
      (3) Two black cones - fishing.
      (4) Two orange and white vertical stripped balls (buoy tender working aids to navigation)



2. Sound signals.
   a. Fog signals.

	Situation	Signal	Intervals
(1)	Underway	- one prolonged blast -	one minute.
(2)	Underway no way on	- two prolonged blasts -	one minute.
(3)	Not under command	- one prolonged, two short -	one minute.

   b. Danger.
      (1) At least five short rapid blasts. (International)
      (2) Four blasts inland waters. (Pilot rules)
   c. Backing.
      (1) Three short blasts. (Only when in sight of another vessel)

d. Overtaking signals required. (Inland)
    (1) One short blast.
        (a) I desire to pass to starboard - overtaking vessel.
            1. Overtaken vessel answers one short blast to signify agreement.
    (2) Two short blasts.
        (a) I desire to pass to port - overtaking vessel.
            1. Overtaken vessel answers with two short blasts to signify agreement.
    (3) Four or more short blasts by overtaken vessel - DO NOT PASS.

e. Unmooring - view obstructed (bend) (inland rules).
    (1) One prolonged blast.

f. Crossing (no signal) - international rules.
    (1) One short blast, by vessel on right.
        (a) "My intention is to maintain course and speed."

g. Meeting.
    (1) If danger of collision present (international).
        (a) Each vessel changes course to starboard to pass port to port.
        (b) If no danger present (international).
            1. Maintain course and speed.
        (c) Signals give intention only (international).
            Example: One short blast my intention to alter courses to starboard.

<u>SUMMARY</u>

1. Lights.
    a. Side lights.
    b. Stern lights.
2. Shapes.
    a. Black ball.
    b. Two black balls.
    c. Two black cones.
    d. Orange and white stripped balls.
3. Sound signals.
    a. Fog signals.
    b. Danger signal.
    c. Backing.
    d. Over taking.

TITLE

Piloting and Basic Navigation

OBJECTIVE

To familiarize the trainee with the methods of piloting and navigation and navigating the coastal waters.

REFERENCES

1. American Practical Navigator, Bowditch, H.O. Pub. No. 9
2. Navigation and Nautical Astronomy, Dutton.
3. Tidal Current Tables for local areas.
4. Light lists for local area.
5. U.S. Coast Guard Regulations CG-300.
6. Coast Pilot (sailing directions).

TRAINING AIDS

1. Local area coastal chart (preferrably a used one).
2. Navigational plotting instruments.
3. Pelorus.
4. Alidade.
5. Fixed navigational devices on bridge such as radar, RDF, fathometer, loran, compass, etc.
6. Sextants.

INTRODUCTION

The Commanding Officer or Officer-in-Charge of a ship or boat is required at all times to know the position of his ship and to avoid endangering it. Since he cannot personally navigate the ship at all times, he must depend upon his navigator, OOD, and other watchstanders to navigate. No matter what position you hold or watches you stand now you may be called upon to perform some function of navigation such as taking a bearing, identifying a light, take soundings, etc. You will be better prepared to do these things if you know how the information is to be used. If you are doing the plotting, you must also be able to obtain the information and know how accurate it is.

PRESENTATION

1. Preparing for piloting.
   a. Time may not be available to allow learning what aids to use for fixes and their characteristics or to determine danger areas,etc.
   b. Break out all charts to be used and insure they are corrected to the latest Notice to Mariners.
   c. Study local Notices to Mariners, tidal current tables, and coast pilot.
      (1) Make pertinent notations on the chart and/or in Navigator's Record Book. Underline or circle printed notations on charts.
   d. Lay out planned track lines, and note danger areas, courses, (true and magnetic) turn bearings, etc.
   e. Check all navigational instruments for proper operation.

f. Within own harbor, memorize all features, aids, soundings, distances, courses, etc. For ease in navigating in low visibility or at night, learn radar picture from different positions.

2. Positions.
   a. Lay out and explain a dead reckoning (DR) track.
   b. Lines of position - a line on which the ship may be presumed to be located at some point along its length. May be in error due to limitations of equipment or human limitations. Practice and good judgement reduce error. May be straight line or curved.
      (1) Bearing.
         (a) Obtained by using alidade, pelorus, gyro repeater, compass, radar (demonstrate each method available and let trainees practice)
         (b) Range - two objects which appear directly, one behind the other. For accurately charted objects, line of bearing obtained without instruments when the objects are in line.
         (c) Demonstrate plotting line of bearing on chart and labelling time above line, bearing angle (true) below line. A range requires only time.
      (2) Distance.
         (a) Obtained by using radar, stadimeter, vertical sextant, angles, etc. (demonstrate all methods available, explaining accuracy.)
         (b) Plotted as an arc of a circle, around the object, and represents points which are equal distances from the objects. The ship should be somewhere on the arc, depending upon accuracy.
         (c) Vertical sextant angles probably least accurate, radar most convenient, stadimeter most accurate when heights of objects accurately known.
         (d) Demonstrate plotting on chart and labelling - time above line and distance in yards below line.
      (3) The fix.
         (a) A fix is obtained by plotting two or more lines of position which were obtained at the same time. Any combination of distances and/or bearings, as long as they are not parallel.
            (1) When lines cross at small angles, slight errors in measurement or plotting the lines result in relatively large errors in the fix.
            (2) 90° angle between lines on two line fix is ideal.
            (3) Demonstrate obtaining a fix, marking and labelling - dot and circle, time and word "Fix".
         (b) Horizontal angle fixes.
            (1) Obtain difference in observed bearing of three objects. Difference is taken between two of the objects and the third. The center object is usually the base object. Any errors in the instrument do not affect this type of fix.

(2) Most accurate by using two men measuring each of the two difference angles from the center object. A sextant for each man is most accurate reading with the settings being made when a third man shouts "mark" at the time the fix is desired.
(3) Sextants are then read and set on a "three-arm protractor".
(4) Plot by fitting protractor to chart by trial and error until each of the three arms pass through the objects used.
(5) Will not work if the three objects lie on or near a circle which also passes through the position of the observes. Avoid by selecting objects in a straight line, or with the center one nearer the other two, or objects widely separated so that the two outside objects are near or greater than 180° apart.
(6) Most often used for precision anchoring and, by buoy tenders, for accurate positioning of buoys.
(7) Using the trainees, demonstrate and practice, if sextants and three-arm protractor available.

(4) Non-simultaneous observations - running fixes.
(a) Occur when there is a time difference between the observations of two lines of position. May be two lines obtained from the same.
(b) Advance first line in the direction of the ship's course. Distance advanced determined by ship's speed and the time difference.
(6 minutes of time at 10 knots is 1 mile in distance)
(1) Extend line of position to cross course line.
(2) Using dividers, mark off distance to advance the line, along the course line from where the line of position crosses it.
(3) Place parallel rule along the line of position (LOP) and move it up until it touches the point on the course line indicated by the distance run.
(4) To advance an arc obtained by a distance LOP it is best to advance the object observed in the direction of the course and strike your arc from that point. Original LOP does not have to be drawn to do this.
(5) Demonstrate both methods of advancing a line of position.
(c) At the point where the latest LOP and the advanced LOP cross is your most probable position at the latest time.
(d) Demonstrate obtaining and labeling a running fix - dot and circle, time, and "R" fix.
(e) Explain effect of current. If not known or used, may place ship in danger.

(5) Running fix without a plot.
(a) Uses trigonometry.
(b) Common type.
(1) Doubling the angle on the bow - if first relative angle 45° from the bow and the second relative angle is 90°

6. Aids to Navigation.
   a. Kinds of aids.
      (1) Landmarks - natural and manmade objects prominent on the shore.
      (2) Seamark - same as landmark but in water.
      (3) Daymark or nightmark - these are landmarks or seamarks useful during daytime or night, respectively.
      (4) Lighthouse.
      (5) Beacon (daybeacon).
      (6) Lightship.
      (7) Buoy.
      (8) Lights.
   b. Visibility of lights (show from list of lights and on charts).
      (1) Luminous range.
      (2) Geographic range.
      (3) Bobbing a light (explain).
   c. Buoys. (Briefly describe each and explain limitations on their use for LOP)
      (1) Can
      (2) Nun
      (3) Spar
      (4) Bell
      (5) Whistle
      (6) Lighted
      (7) Combination
      (8) Colors and markings
   d. Fog signals. (Briefly describe each as it is used and its sound)
      (1) Bell
      (2) Diaphone
      (3) Diaphragm horn
      (4) Reed horn
      (5) Siren
      (6) Whistle)
7. Tides and currents (using the tidal current tables, demonstrare and let trainees practice obtaining time for high and low tides, maximum flood and ebb, and slack water. Can prepare tables for future use)
   a. Demonstrate use of current diagrams.
8. Miscellaneous.
   a. Allow for turning characteristic of the ship when making course changes. (Explain advance and transfer)
   b. Precision anchoring (explain).
   c. Use of electronics.
      (1) Loran may be used in many areas.
      (2) Radar
      (3) Radio direction finder - not extremely accurate but usable and can be used with the RDF and tidal current tables, can produce highly accurate estimated positions (EPs).
9. Common errors to avoid are failure to:
   (a) Obtain or evaluate soundings.

b. Identify aids to navigation.
c. Use all available navigational aids.
d. Correct charts.
e. Adjust magnetic compass or maintain an accurate table of corrections.
f. Apply deviation or allowing errors in its application.
g. Apply variation or to allow for change in variation.
h. Check gyro and magnetic compass readings at frequent and regular intervals.
i. Keep dead reckoning plot.
j. Plot information received.
k. Properly evaluate information received.
l. Do own navigating (following another vessel).
m. Obtain and use information available on charts and in various publications.
n. "Keep ahead of the vessel" by planning and checking ahead.
o. Use good judgement.
p. Have good and efficient organization.

SUMMARY

Safe passage through inland and coastal waters required proficiency in piloting, through knowledge of basic navigation, and general familiarization with these basic rules by all hands.

Preparation is the most important phase in piloting. Piloting consists primarily of using lines of position from shore objects to determine fixes, the accuracy of which is determined by the limitations of the equipment and the person obtaining the LOP. Danger bearings and angles aid in avoiding shoals, wrecks, and other dangerous areas. Piloting further consists of using tidal current tables, soundings, aids to navigation, and electronic aids to insure the best possible information for determining the location of the ship and if it is safe or heading into danger. Remember that if you fail to use all available means, you are not doing your job.

TITLE

Magnetic compass

OBJECTIVE

To familiarize trainees with the magnetic compass and how to use the deviation tables such as converting from magnetic to true.

REFERENCES

1. Navigation and Nautical Astronomy, Dutton.
2. Coast Guardsman's Manual.

TRAINING AIDS

1. Blackboard and chalk.
2. Actual compass (if available).
3. Deviation tables.

INTRODUCTION

Everyone in the service should know the principles of the magnetic compass and how to convert to true using up to date variation and deviation tables.

PRESENTATION

1. General characteristics.
   a. Magnetized compass needle points to earth's magnetic field.
   b. Needles are fastened to a card shaped as a disc and marked with the cardinal points, such as north, east, south, west.
   c. The card and needles are supported on a point. The card is free to rotate no matter what the ship or boat does - will always point to the magnetic north.
   d. Moving parts are contained in a bowl of liquid to allow the card free movement. The liquid is called "varsol".
   e. Attached to the bowl is a lubber's line to show own ship's heading.
2. Correcting and uncorrecting.
   a. Add easterly, subtract westerly (correcting to true).
   b. Add westerly, subtract easterly (uncorrecting from true to compass heading).
   c. Formula parts.
      (1) Compass - Reading
      (2) Deviation - Off posted tables
      (3) Magnetic - Actual magnetic heading
      (4) Variation - Off chart
      (5) True - True bearing

d. Formula (place on blackboard).

C D M V T

Uncorrecting ←— W & E —→ Correcting

e. Give examples to trainees and have them compute.

SUMMARY

We now have a basic knowledge of the magnetic compass, its use, correcting and uncorrecting. The formula is "Can Dead Men Vote Twice." Add easterly when correcting and westerly when uncorrecting.

TITLE
Loran operation and basic theory.

OBJECTIVE
To familiarize the trainees with the basic theory and operation of Loran equipment.

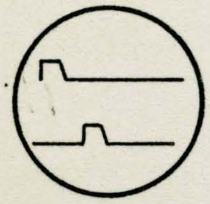
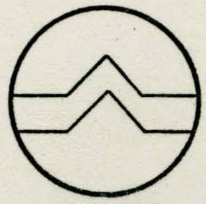
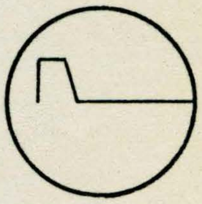
REFERENCE
1. Instruction Booklets as available in Unit's library.

TRAINING AIDS
1. Blackboard and chalk

INTRODUCTION
Loran is one of the newest methods of navigation, being first used in 1941. Coverage increased over the years until now the world is almost completely covered by loran.

PRESENTATION
1. Basic principles.
    a. Loran
        (1) Means LO-long, RA-range and N-navigation.
2. Electronic device.
    a. To measure time differences in micro seconds.
    b. Differs from radar by these basic ways.
        (1) Does not require transmission from unit.
        (2) Measures difference between two signals instead of one.
3. Accuracy.
    a. Best accuracy.
        (1) Near base line.
    b. Ground waves.
        (1) Accurate to 1.5 miles.
        (2) Over 80% of covered areas.
    c. Sky waves.
        (1) Accurate to 5 - 7 miles.
        (2) Over 80% of covered areas.
    d. Greatest source of error.
        (1) Small crossing angles of positions.
4. Obtaining a line of position.
    a. Sequence.
        (1) Select rate.
        (2) Align signals, step one.
            (a) Place on pedestals.

(3) Step two (enlarges pedestal to full screen width).
   (a) Align signals under each other center of scope.
(4) Step three - final step.
   (a) Align signals center of scope.
   (b) Adjust gain to make signals even.
   (c) Match leading edges of both signals.
(5) Time difference read on dial.
(6) Drawings (show on blackboard).

Step 1  Step 2  Step 3 

5. Obtaining a fix.
   a. At least two rates needed.
6. Plot fix using loran chart and scales.

SUMMARY

We now can see the greatest advantage of using loran. Of course, accuracy depends on signal strength and operator ability. There are three basic steps and missing one could throw entire fix off.

TITLE

Radio direction finder operation

OBJECTIVE

To familiarize the trainees with basic theory and operation of the radio direction finder.

REFERENCE

1. Instruction Material as available in Unit's library.

TRAINING AIDS

1. Blackboard and chalk.

INTRODUCTION

Radio direction finder is used primarily for navigation but is an excellent device for locating a distressed vessel. As you know the primary duty of the Coast Guard is life saving and we may use any means available to assist us in locating a vessel in distress.

PRESENTATION

1. Operation
    a. To energize.
        (1) Use operating instructions posted.
    b. Obtaining a fix.
        (1) One station - line of bearing - from transmitting station.
2. Two or more stations needed to obtain a fix.
    a. Use bearing correction tables posted.
    b. Plot on appropriate chart.
    c. Use in distress phase.
        (1) Fore line of bearing only.
3. Theory.
    a. Antenna.
        (1) Usually a loop.
        (2) Can be rotated (mechanically or electrically).
            (a) Loop bearing coincides with bearing on set.
            (b) Rotate antenna until no signal is heard.
            (c) Use correction table for correct bearing.

SUMMARY

The reliability of the radio direction finder depends on strength of signal received and the operators ability to obtain an accurate fix. Remember, practice whenever possible to become efficient and to improve your own accuracy.

NUMBER C006

TITLE
Radar Operation

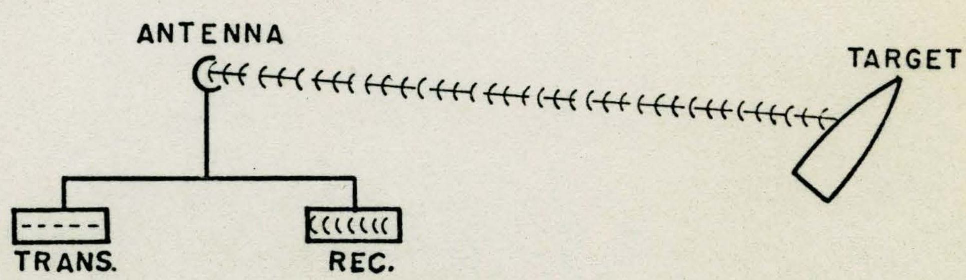
OBJECTIVE
To teach the basic theory and controls of a radar set.

REFERENCES
1. Radar Manual for unit's own particular receiver.

TRAINING AIDS
1. Unit's radar receiver.
2. Blackboard.

INTRODUCTION
In days of old, ships sailing the seas were limited in their ability to navigate in fog and bad weather. With the introduction of radar, ships now may travel safely at night in fair or foul weather. Radar, when operated by personnel who properly utilize the information given, has been an important factor in the safe navigation of ships.

PRESENTATION
1. Principles of radar operation.
   a. The word "RADAR" means RAdio Direction And Ranging. The letters R-A-D-A-R spell the same forward and backward, giving a clue to its principle of sending out a radio beam, having it strike an object and then being reflected back as an echo. All this happens very fast (186,000 miles per second), but the tubes and other components are so designed that the radar will indicate the direction (bearing) and measure the range (distance). (Use blackboard at this time, spelling out the word "RADAR" and demonstrate as shown above.)
   b. Energy from the radar transmitter travels up the wave guide to the antenna. This energy is projected by the antenna. When a target is hit with this energy it bounces off and returns to the antenna. Although this energy, more commonly referred to as an echo, is very weak, it returns down the waveguide, and is amplified by the radar receiver and in turn displayed on the scope. At this point, draw a picture of the above. Example:



If two or more targets are relatively close together at about the same range, their widened pips may merge, appearing as a single pip of a larger target. The minimum difference in bearing between two objects at the same range that can be separated by radar is called its resolution in bearing.

c. Resolution in range is the minimum difference in range between two objects on the same bearing that can be separated by radar.

2. The receiver and its controls.
   a. Since the indicator unit is the part of the equipment which will be used by the operator, a description of the more important controls and functions is called for. At this point, turn on radar and show each man the radar "picture", let each man take a fix using cursor control and range rings, fixed or variable, or both (whichever pertains).
   b. The indicator uses a cathode ray tube, called the "scope" or "PPI" (plan position indicator), a radial beam of light, from the center of the scope to the outer edge. Rotation is in step with the antenna. Each time this beam or sweep hits the target, it leaves a spot of light to mark the range and bearing of the target.
   c. The contrast control.
      (1) This control is used to adjust the brilliance of targets. This control should be regulated each time the range scale is changed, so that targets are as bright as possible. However, it must be remembered that excessive use of this control will cause the target to become fuzzy, thereby reducing clarity. (Demonstrate at this point.)
   d. Range rings.
      (1) This control is used to adjust the intensity of the electronic range rings which appear as concentric circles on the face of the scope. Show class how this works.
   e. Gain control.
      (1) This control is roughly equivalent to the volume control on an ordinary radio. This control adjusts the brilliance of the targets on the scope. To a considerable extent, it determines the range over which targets will be picked up. (Stress this point and demonstrate.)
   f. Focus control.
      (1) This control is used to sharpen any blurred appearance of PPI sweep. (Show class.)

a. FTC - STC or suppressor controls.
   (1) The purpose of this control is to minimize obscuring of targets near the ship during a heavy sea. (Explain sea return to men.)

3. Tuning.
   (a) In order for a radar receiver to operate at its best, certain steps must be taken to provide maximum signal strength. The best way to do this is stop the antenna on a target and then follow your tuning procedures as outlined in your radar service manual.
4. Calibration.
   (a) This is an internal adjustment which will rectify any error in your range rings. The need for this is so more accurate ranges can be obtained. Refer to manual for procedure. Point out to class that routine service work on the received will normally involve tube replacements only.
5. Safety.
   (a) Safety precautions with any electronic equipment is basic. Never work on the equipment while the radar set is on. Try never to work alone. Be familiar with the use of a dead man's stick. (Show the class the dead man's stick and explain the purpose.)

<u>SUMMARY</u>

1. Review the following points.
   a. Principles of radar operation, making sure you point out each component.
   b. Point out the different controls and what they do.
   c. Discuss safety precautions.
   d. To close your lesson, emphasize that while radar is a great aid to the ship, it is only as good as the interpretation a good operator gets from the information which is made available.

TITLE

Radar Navigation

OBJECTIVE

To instruct the men in radar navigation.

REFERENCE

1. Organization and Regulations Manual for Patrol Boat, CG-260-6

TRAININGS AIDS

1. Unit's radar receiver.
2. Local harbor chart.
3. Dividers, compass, parellel ruler.
4. Blackboard.

INTRODUCTION

The mere presence of radar aboard ship will contribute nothing to the safety of the vessel. It is not a good-luck charm. The radar set must be in good operating condition and in use by a competent observer. Proper maintenance is important. At the first sign of failure to provide reliable information, the equipment should be checked. The set should not only be kept in good operating condition, but also in proper adjustment.

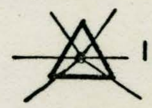
PRESENTATION

1. Advantages of radar.
   a. Radar can be used at night and during periods of low visibility. (fog, snow, etc)
   b. A fix can be obtained from a single object.
   c. Radar fixes can be obtained rapidly.
   d. Radar navigation is often more accurate than other methods of piloting.
   e. Radar may be available at greater distances from land than most methods of piloting. (stressing range)
   f. Radar is an effective anti-collision device.
   g. Radar can be used to locate and track violant tropical storms.
2. Limitations of radar.
   a. Radar is subject to mechanical and electrical failure.
   b. There are minimum and maximum range limitations.
   c. Interpretation of the information presented on the scope is not always easy, even after considerable training.
   d. Radar may be less accurate than other methods of piloting. A visual bearing, for instance, is usually more accurate than a radar bearing.
   e. Radar may be unreliable or unavailable during conditions of poor radio communication.

f. Charts do not always give information necessary for identification of radar echoes.
g. Small boats, buoys, etc, may not be detected, especially if a high sea is running or if they are near the shore.

3. Range limitations.
   a. The minimum range is dependent on several factors. However, the most common is sea return. Excessive sea return from nearby water and other obstructions **nearby** will effect minimum effective range.
   b. Maximum range is usually limited by the curvature of the earth to the line of sight or slightly more, because high frequency radio waves travel in a straight line and do not follow the earth's curvature except under abnormal atmospheric conditions.
   c. Good illustrations for use on your blackboard can be found in Duttons, Chapter 7, pages 192-193.
4. Types of radar fixes. (Demonstrate each item)
   a. Two ranges (or more). This provides the most accurate fix.
   b. Two bearings (or more).
   c. Range and bearing of a single object.
   d. Use both radar and chart; allow men to try each type of fix.
5. Organization and procedures.
   a. Location of key personnel. (The best radar operator should be utilized, if practical.)
   b. The plotter on the chart should be familiar with use of compass and dividers.
   c. A separate scale in yards could be placed on the chart in order to provide the plotter with a fast way in which to measure the distance given to him by the radar operator. (When using radar for navigation in fog, the lowest scale is used.) However, if a fix is not obtained within two minutes, sometimes changing to a larger scale will enable the operator to obtain a fix.
   d. The best fix is three radar ranges (radar **ranges are the most** accurate). If three ranges do not produce a fix, another round of ranges should be used. If no fix is obtained after two minutes, recommend "all stop." This will give the radar operator a chance to pinpoint the vessel's position.
   e. Set, drift and wind are all considerations which will have an effect on the vessel's position when operating at slow speeds. This information should be updated and given to the plotter as changes occur.
   f. After each fix is obtained, a DR plot should be extended along the track for at least three minutes. This enables the plotter to have some idea as to where the vessel should be at all times. It also serves as a check on set and drift after another fix is obtained.

g. A radar fix consists of three range arc's, identified by a diamond with a small dot in the center.

Example:  12ØØ

Time is always noted alongside the fix.

6. Training.
   a. Practice radar navigation as often as possible, as the more experience your radar navigation team gets, the better it will function. Compare visual fixes with radar fixes.
   b. Train lookouts in Rules of the Road - always practice with lookouts, utilize the information the lookouts report. Have a recorder, keep a record of all lookout reports and time given.
   c. While conducting radar navigation in good visibility for drill, make it a habit to only use the targets which give the best definition on your scope. Never use buoys, beaches, marshes, etc. Breakwaters, piers, etc, make best fixes. Keep in mind that you should use the targets that usually give the best results - you can determine these points by practice.
7. Special measures.
   a. Immediately notify the Officer in Charge of visibility changes.
   b. Station lookouts to report all sights and sounds.
   c. Observe and comply with all applicable sections of the Nautical Rules of the Road.
   d. Set material condition Yoke throughout the vessel.
   e. Place radar, fathometer, and radio direction-finder in operation - fathometer should be utilized and a comparison made with the depth at time of each fix.

<u>SUMMARY</u>

1. In concluding your lesson, go over the following.
   a. Review advantages.
   b. Review limitations.
   c. Re-explain range limitations.
   d. With aid of chart, dividers, compass, show the three types of fixes, allow men to practice plotting ranges.

TITLE

Introduction to Search and Rescue

OBJECTIVE

To acquaint trainees with the search and rescue organization as outlined in the National Search and Rescue Manual, CG-308.

REFERENCE

1. Search and Rescue Manual, CG-308.

TRAINING AIDS

1. Copy of National Search and Rescue Manual, CG-308.
2. Blackboard.

INTRODUCTION

The probability of finding survivors and their chances of survival diminish with each minute that passes after an incident occurs. Records have proven that the life expectancy of injured survivors decreases as much as 80% the first 24 hours. The chances of survival for uninjured survivors rapidly diminish after the first three days. As a Coast Guardsman you will more than likely come in contact with some phase of a search and rescue operation. You should therefore have an understanding of the various SAR terms and definitions.

PRESENTATION

1. Authority for search and rescue.
   a. The Coast Guard has specific authority and responsibility for developing, establishing, maintaining and operating rescue facilities and for rendering aid to distressed persons and property. Under the National SAR Plan, the Coast Guard has been given the additional responsibility of organizing available SAR facilities into a single network within the maritime region.
   b. ICAO (International Civil Aviation Organization) is a worldwide intergovernmental organization formed for the purpose of insuring the safe, orderly and efficient growth of international civil aviation under the terms set forth by this organization. Members undertake to provide such measures of assistance to aircraft in distress in its territory, regardless of nationality.
2. Responsibility.
   a. The United States, under the convention of International Civil Aviation, has an international obligation to furnish certain SAR facilities.
      Example: Ocean Station Vessels.
   b. The National SAR Plan provides an overall plan for the control and coordination of all available facilities for all types of search and rescue operations.

This plan establishes three SAR regions and designates regional SAR coordinators as follows:

The Inland Region - Air Force
The Maritime Region - Coast Guard
The Overseas Region - Overseas Unified Commanders

3. Organization.
   a. A SAR Coordinator is an official responsible for coordinating and, as appropriate, controlling SAR operations of a SAR region, sub-region or sector. A SAR sub-region is the geographical area formed by dividing SAR regions into smaller areas of responsibility. A SAR sector is a division of a SAR sub-region. (See page 2-6 for duties of SAR coordinator)
   b. The Chief of Staff, US Air Force, has designated the Commander, Air Rescue Service as his Executive Agent in implementing the National SAR Plan in the Inland Region.
   c. The Commandant, US Coast Guard, has divided the Maritime Region into two major areas of responsibility - the Atlantic Maritime Region, with Commander, Eastern Area and Commander, Western Area as SAR Coordinators.
   d. The Secretary of Defense designates certain Defense Department officers as unified commanders of specified areas where U.S. forces are operating.
   e. RCC's will vary with the physical location and the regional level on which they are operated but all will have the common element of centralized communication and coordination. RCC's shall be staffed with RCC Controllers capable of acting as SAR Mission Coordinators. (Covered in detail, Chapter 4, CG-308)
   f. A SAR Mission Coordinator is an official designated by a Regional, Sub-regional or Sector SAR Coordinator for coordinating and controlling a specific SAR mission. (See page 2-7 for duties)
   g. An On-Scene-Commander controls SAR operations and communications at the scene of distress mission, when control of the mission cannot be exercised effectively by the SAR Mission Coordinator. The OSC is subordinate to the SAR Mission Coordinator. (For duties see page 2-8)
4. The SAR incident.
   a. The three types of SAR incidents are aircraft, surface vessel, submarine. Submarine incidents differ from other SAR undertakings in that they are complex operations involving special equipment and procedures peculiar to the submarine service.
   b. The three phases of emergency are: Uncertainty Phase - Alert Phase - Distress Phase. (Explain the three types, Ref. page 3-3, CG-308)
   c. When certain that an emergency phase no longer exists, the SAR Coordinator shall close the case.

SUMMARY

1. Review authority for search and rescue, include explanation of ICAO.
2. Cover National SAR Plan, the breakdown of regions, sub-regions, and sectors. Stress Coast Guard Maritime Region.
   a. RCC's.
   b. Duties of SAR Coordinator, SMC, OSC.
   c. Review the SAR incident, phases and types.

TITLE
Search Patterns

OBJECTIVE
To point out the different types of search patterns and when they are used.

REFERENCES
1. Search and Rescue Manual, CG-308.
2. Norfolk SAR Planner.

TRAINING AIDS
1. Copy of Search and Rescue Manual.
2. Blackboard.

INTRODUCTION
The selection of search patterns may well be the difference between success or failure. Often only one type of pattern will be used. In other cases, several patterns or a sequence of patterns will have to be employed.

PRESENTATION
1. Sector search patterns.
   a. Sector search patterns are employed when the position of distress is known within close limits and the area to be searched is not extensive. Most important, the track spacing is small near the center point or datum of the search and larger at the extremities. This results in an increased probability of detection near datum, where the target is most likely to be.
   b. Draw sector search pattern on blackboard.
2. Expanding square patterns (single unit).
   a. This pattern is used for a concentrated search of small areas where the position of survivors is known within close limits and the area to be searched is not extensive.
   b. Draw example of expanding square for a single unit on blackboard.
3. Expanding square multi-unit.
   a. The expanding square is not suitable for employment of two or more units searching in an abeam formation due to the difficulty of station keeping. When more than one unit is used they should start their pattern with different starting times and the axis of search should differ by 45° from the unit ahead.
   b. Draw example of multi-unit expanding square on blackboard.
4. Parallel track patterns (aircraft searches).
   a. These patterns are generally selected when
      (1) The search area is large and relatively level.
      (2) Uniform coverage is desired.
      (3) Information concerning the target is limited to a knowledge of the approximate area. This pattern is best adapted to rectangular or square areas.

b. Draw parallel track for a single unit on blackboard.

5. Parallel track multi-unit.
   a. This type pattern provides very accurate track spacing, faster area coverage, and an increased safety factor for aircraft over water. One search unit is designated as guide and handles navigation, communications and control of team.
   b. Draw parallel track multi-unit on blackboard.
6. Parallel sweep.
   a. This pattern is used when simultaneous sweep of an area to maximum radius is desired. It provides concentrated coverage of large areas in a minimum period of time.
   b. Draw example on blackboard.
7. Contour pattern.
   a. This type of search is used for mountain slopes and valleys. The search is started above the highest peak and the aircraft flown around the mountain, close to the mountain side.
   b. Draw example on blackboard (making sure to point out that this type search can be dangerous unless conditions listed on page 7-23 are met).
8. Creeping line patterns.
   a. These patterns differ from the parallel track pattern only in that the search legs are parallel to the short axis of the rectangular area. They are generally selected when:
      (1) Rapid advancement of successive search legs along a given track is desired.
      (2) For coverage of the most probable area first.
      (3) Information concerning the target is limited to a track between two points where distress position may be to either side of track due to navigational error or drift.
9. Creeping line - multi-unit.
   a. This pattern is the same as single unit, except two or more units are used cruising abreast with turns and cruising control in same manner as parallel track multi-unit.
   b. Draw example on blackboard.
10. Coordinated air-surface team patterns
    a. This pattern should be employed when aircraft and surface vessels are available. The track of the aircraft is planned so that the advance of the successive legs of the search pattern equals that of the surface vessel, and the aircraft passes over the surface vessel on each leg. This results in a more accurate search pattern and rescue by surface vessels can be effected within a short time once survivors have been located by search aircraft. The vessel is used primarily as an aid to navigation and to identify objects sighted by the aircraft.
    b. Draw example of coordinated creeping line - single unit on blackboard.
11. Coordinated creeping line - multi-unit.
    a. This type pattern provides a more accurate search with faster

coverage. Two or more aircraft are used cruising abreast. The guide aircraft passes over the ship on each leg.

b. Draw example on blackboard.

12. Radar coordinated creeping line single unit.

a. In this type pattern the ship assists the aircraft in keeping on course by frequent radar fixes. The ship also advises the pilot when he is five miles from the end of each leg in order for the pilot to make an accurate turn into the cross leg. Also whenever the aircraft is within the visual range of the ship, visual bearings should be taken and plotted with radar ranges. This will prove more accurate than relying on radar bearings.

13. Radar coordinated creeping line multi-unit.

a. This pattern in which two or more aircraft are used in an abeam foundation. The surface unit tracks and plots only the guide aircraft. If difficulty is experienced tracking aircraft, the guide aircraft should take station a half mile ahead of the other aircraft to improve radar identification.

14. Split coordinated line.

a. This pattern is used when a coordinated creeping line is desired with more than one aircraft and visibility is good. The main advantage of this type pattern is when aircraft have such a differential in speed that they cannot be employed in abeam formation. Also the pilots do not have to fly formation on a leader.

SUMMARY

There are many types of search patterns which may be used depending on the number and types of search units and the area to be searched. Small CG vessels will use primarily the sector search for a concentrated search of a small area, the expanding square search for a relatively small area and the coordinated creeping line search, in which the vessels steam a steady course and speed and an aircraft flies the creeping line to intercept the vessel on each leg. Review the sector search, expanding square search and the coordinated creeping line search.

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b. Draw example on blackboard.

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There are many types of search patterns which may be used depending on the number and types of search units and the area to be searched. Small CG vessels will use primarily the sector search for a concentrated search of a small area, the expanding square search for a relatively small area and the coordinated creeping line search, in which the vessels steam a steady course and speed and an aircraft flies the creeping line to intercept the vessel on each leg. Review the sector search, expanding square search and the coordinated creeping line search.

NUMBER D003

TITLE

Computing the Search Patterns

OBJECTIVE

To teach how to compute search patterns including the use of a sample problem to illustrate.

REFERENCES

1. Search and Rescue Manual, CG-308
2. Norfolk SAR Planner

TRAINING AIDS

1. Blackboard.
2. Copy of Search and Rescue Manual, CG-308

INTRODUCTION

In order to conduct a search pattern, an understanding of how to compute one is required. There are tables which have been made up for this purpose. Correct use of the tables and certain "rules of thumb" will be covered in this lesson. Problems of solving coverage factor, track spacing and sweepwidth should therefore become an automatic procedure.

PRESENTATION

1. The four factors of search coverage are:
   a. Probability of detection (p)
   b. Sweep width (w)
   c. Track spacing (s)
   d. Coverage factor (c)
2. In using the table (figure 7-2 National Search and Rescue Manual) for finding sweep width the following information is needed.
   a. Type of target (life rafts, small boats, 30-60, etc)
   b. Meteorological visibility (down left hand column, 1, 3, 5, 10 miles etc.)
   c. Location of search unit. Vessels use columns under surface with appropriate target. Aircraft use appropriate column in accordance with their altitude. 500, 1000, 2000, 3000 feet with appropriate target (life raft, small boat, 30-60 etc)

      Example: Determine sweep with (w) for:

Target	Visibility	Altitude	w
liferaft	15 miles	1000 ft.	2.6
small boat (less than 30')	3 miles	500 ft.	2.0
large vessels	10 miles	3000 ft.	11.3

   d. A rule of thumb is if the target you are looking for is a man in the water you should use half the sweep with (w) obtained from the figure under liferaft. Example: If you had 5 miles visibility looking for a man in the water with a surface vessel the table shows 1.4. However, in this case you would use 7 as the sweep widt (w).

3. The figures at the extreme left are visibility expressed in miles.
    a. An example would be visibility, 5 miles, target, life raft. Using the table for sweep width, start at far left hand side and find the number 5. Follow across one position and you will find the figure 1.4 (note this falls under the column entitled surface). You will further note a column for surface under each type of target. This is used when only a surface vessel conducts the search.
    b. You now have the figure 1.4, this becomes (w) or sweep width.
    c. You will also note on this page a separate scale entitled white cap correction factors. The five objects on the left indicate the object you are looking for, the top row across is the velocity of wind expressed in knots. Using an example of 15 knots wind, we find rafts in left hand side. We follow across the column under 15 and find the figure 9.
    d. We now multiply this figure 9 by 1.4 (w) and our corrected sweep width becomes 1.26.

$$\begin{array}{r} 1.4 \\ \underline{.9} \\ 1.26 \end{array} = (w)$$

Note that there is only one white cap correction factor for all small boats. In the lower right hand corner of the table are the specific sweep width (w) to be used when searching for the particular signal. i.e., mirror (w = 8 miles). Orange smoke (w = 12 miles),very light (w = 24 miles). Further note there are wind correction factors for dye markers and smoke listed with white cap factor. Example: A jet pilot has ejected from his plane while enroute from his carrier to NAS Norfolk. It is known that he has a signal mirror and day-night signals. It is overcast and the wind is 20 knots. It is decided to conduct a rapid search of his trackline based on seeing an orange smoke signal. From lower right table the sweep width (w) for orange smoke is twelve miles. From lower left table the wind correction factor for smoke is 0.6'. Multiplying (w) 12 by .6 - 7.2 miles for a corrected sweep width.

4. The next thing to consider is the equation coverage factor. $C = \frac{W}{S}$

If the SAR mission coordinator (SMC) tells you to conduct a search with a specific probability of detection (POD) or if as the On-Scene-Commander (OSC) you decide to conduct a search with a specific POD, you enter the table figure 7-4 of the Search and Rescue Manual with the specific POD desired. Example: Search a given area the first time with a POD of 75%. Enter table 7-4 on the left side with the figure 75. Proceed to the right until you reach the curved marked first search. From this intersection read down vertically and you see the coverage factor (C) is equal to 0.93. Note: Use the curve for the appropriate search of a given area before the vessel arrived

and the vessel searched the same area it would be the second search of the area and you would use the curve marked second search. Example: An aircraft has searched the area before you arrived. You are told to conduct an expanding square search with a POD of 60%. Enter table 7-4 on the left with the figure 60. Proceed to the right to the curve marked second search. From this intersection read down vertically and you see the coverage factor C is equal to 0.37. We can now solve a problem to compute the track spacing. Example: A boat is reported sinking with two men aboard. The visibility is 10 miles and the wind is 20 knots. The boat is assumed to have sunk so a search is based on looking for two men in the water. An aircraft has conducted a sector search of the same area. You arrive in a surface vessel and are to search the same area with a POD of 75%. Enter table figure 7-2 for the sweep width. Enter table with the figure 10 miles visibility in the left column. Proceed to the right one space under the surface column for lift rafts. Sweep width is 1.8 (remember the thumb rule for a man in the water, we use one half the sweep width for a life raft, in this case 0.9). We must now correct this sweep width for the white cap factor. In the left hand column for life rafts we proceed to the right to the space under 20 knots. The white cap correction factor is 0.7. Multiplying the sweep width (w) 0.9 by the white cap correction factor 0.7 (.9 time .7) we get a corrected sweep width of 0.63. We now enter figure 7-4 with the POD 75% on the left hand side and proceed to the right to the curve marked second search. Read down vertically and you see the coverage factor (c) is equal to 0.53. We now have sweep width (w) - .63 and coverage factor (c) - 0.53 and can solve the equation $C = \frac{w}{s}$

$C = \frac{w}{s}$ therefore $S = \frac{w}{c}$ $S = \frac{.63}{.53}$

We could then plot the expanding square search with the legs 1.19 miles apart. For a practical navigation and search problem you would use S = 1.0 miles and plot the legs of your search 1 mile apart.

5. For most practical purposes you can conduct a search with sweep width (w) equal to trackspacing (s). Since W = S the coverage factor is equal to 1.0.
   Example: $w = .63$ $s = .63$ $C = \frac{w}{s}$ $C = \frac{.63}{.63}$ $C = 1$

   a. With a coverage factor (C) equal to 1 the probability of detection (POD) on the first search would be 78%. On the second search it would be 95%. On third search it would be 98%. (Point this out using figure 7-4.)

b. In this case you enter figure 7-2 and determine the sweep width. You correct the sweep width for the white cap factor and then use this corrected figure for track spacing. This figure can be rounded off for practical navigation.

(1) Example: A 35 foot fishing vessel is broken down and is overdue. The visibility is 15 miles and the wind is 20 knots. You are going to conduct a creeping line search with a vessel parallel to the shoreline from shore to 20 miles off shore. What track spacing would you use?

(2) Enter table 7-2 with 15 miles visibility in the left hand column. Proceed to the right to the surface column under small boats. (30-60). Sweep width (w) equals 8.5. We must now correct this sweep width for white cap factor. Enter the white cap correction factor table beside small boats and proceed to the right to the column under 20 knots. The white cap correction factor is 0.7 (note there is just one column for all small boats in the white cap correction table). Multiplying the sweep width (w) 8.5 by the white cap correction factor 0.7 we get a corrected sweep width of 5.95.

(3) We would use a track spacing equal to 6.0 miles. We would lay out a creeping line search with the legs 6 miles apart. The legs would be 14 miles long from 3 miles off shore to 17 miles off shore.

(4) When the search of the area has been completed, we must report the probability of detection. To do this proceed as follows:
Corrected sweep width (w) equals 5.95
Track spacing (S) equals 6.00

Coverage factor (C) = $\frac{w}{s}$ $\quad C = \frac{5.95}{6.0}$

C = .99

Enter table 7-4 with the coverage factor (0.99) at the bottom of the page. Proceed up vertically to the curve marked first search (no other unit has searched the area). From this intersection proceed to the left and you see the probability of detection was approximately 78 percent.

(5) By using track spacing equal to the corrected sweep width and rounded off to the nearest half mile you are not likely to make an error and your probability of detection will be between 70 and 80 percent. There are times when you will desire to do this. Example: You wish to search a larger area with a smaller probability of detection (50%) than a smaller area more thoroughly in the same amount of time due to the limited time of survival in cold water or the limited hours of daylight.

6. Precautions and Rules of Thumb.
   a. Prior to laying out your search pattern check the chart or the area and make sure your pattern does not run into danger areas. You would not want to run a pattern over land or shallow water. After a check of the area in which you will be conducting a search you may find that you cannot run the pattern on your original selected axis. Therefore, you must either change the axis or select a different pattern.
   b. Another point to consider is the current if you start your pattern downwind and parallel to the current the chances of having the object slip pass you while conducting the search are reduced.

SUMMARY

a. Review the four factors of search coverage.
b. Cover the information needed to use sweep width and probability of detection tables.
c. Point out the use of the equations, make sure you stress that they are inter-related.
d. Review why you would deviate from the rule of thumb S=W.
e. Using example problem explain how to compute track spacing.
f. Explain how to lay out an expanding square search.
g. Point out precautions to be used in laying our search pattern.
h. Consider wind and current in laying out search pattern.
i. Rule of thumb for man in water (Y2 sweep width for life raft).
j. Cover use of sweep width table for aircraft.

NUMBER D004

TITLE
Conducting the Search

OBJECTIVE
To point out the duties of surface craft assigned to search and rescue, including the use of SITREPS.

REFERENCES
1. Search and Rescue Manual, CG-308.
2. Norfolk SAR Planner.

TRAINING AIDS
1. Blackboard.
2. Copy of Search and Rescue Manual, CG-308.

INTRODUCTION
Vessels have the ability to search a limited area quickly and thoroughly if properly used. Vessels may be employed with aircraft in a coordinated "Air Surface Team". This type of search is one of the most effective and accurate possible.

PRESENTATION
1. List procedures for surface craft assigned to search duties (pg 8-16 CG-308).
2. List surface craft special duties in coordinated ship-aircraft searches (pg 8-17, CG-308).
3. Lookouts.
    a. The lookout should be aware of what the object of the search is. Because the sighting range from surface vessels is limited, lookouts should be stationed as high as possible. Much of the technique used by aircraft lookouts can also be applied to lookouts of vessels.
    b. List on blackboard International Distress Signals (pg 8-18, CG-308).
4. Sighting by surface craft.
    a. Procedures on sighting survivors will differ according to whether the sighting occurs in the daytime or at night.
    b. List on blackboard day and nighttime procedures (pg 8-17, CG-308).
5. Situation reports (SITREPS).
    a. SITREPS are a convenient means of reporting the operational situation in SAR. SAR units send SITREPS only to the on-scene-commander who in turn reports only to the SAR mission coordinator.
    b. SITREPS shall be serially numbered, commencing with "SITREP ONE". The final report shall be "SITREP (NUMBER) AND FINAL".
    c. The SITREP shall identify the emergency phase as: uncertainty, alert, or distress.
    d. Omit the emergency phase in the final SITREP because then the emergency no longer exists.

e. Never repeat information already given in previous SITREPS.
f. Using check-off list for SITREPS (pg 3-7 Norfolk SAR Planner) write on blackboard a sample of a SITREP.

SUMMARY

1. Review procedures for surface craft including coordinated ship-aircraft searches.
2. Cover lookout procedures, including International Distress Signals.
3. Point out sighting procedures (day, night).
4. Using a sample SITREP, show how to make one up. Stress only OSC sends to SAR Coordinator, cover also how they are numbered.

TITLE

Maneuvering Board

OBJECTIVE

To teach the use of a maneuvering bord for use in SAR.

REFERENCES

TRAINING AIDS

1. Maneuvering board (H.O. 2665-20).
2. Parallel ruler, dividers.
3. Blackboard.
4. Copy of CG-308, National Search and Rescue Manual.

INTRODUCTION

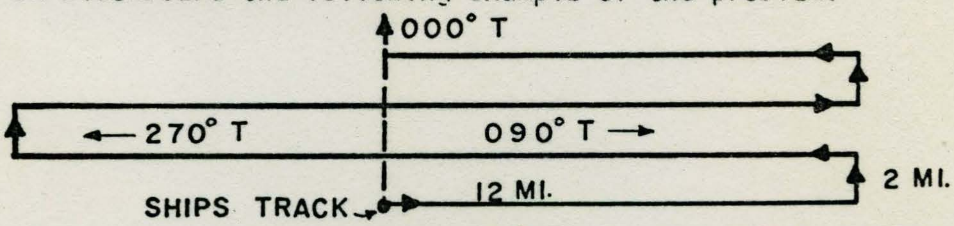
In order to conduct a search pattern and stay as close to the original plan as possible, an understanding of the maneuvering board is required.

PRESENTATION

1. Use of a problem to explain subject.
   a. Current from 035° speed 2 knots.
   b. Conduct expanding square search track spacing 2 miles axis 000° T ships speed 10 knots.
   c. What courses will we have to be steered in order to make good our search pattern?
2. Layout the expanding square search pattern with two (2) mile track spacing as shown in problem 1.
3. Procedure for solving problem.
   a. Using your maneuvering board, construct vector A-B (ref: problem 1). This indicates the bearing and velocity of the current.
   b. We know that our first course is 000° T (the axis of the search plan).
   c. We now parallel 000° T to point B and construct vector B-C. (Note that point cl is on the lo knot circle.)
   d. The next step is to construct vector A-cl by connecting the two points. You will now note that the heading indicated by A-cl is 007° T, which we will have to steer in order to make 000° T good.
   e. Vector A-cl indicates our course to steer, and vector B-cl if measured with dividers will give us our actual speed we will make good on this course. As seen, we will be going almost into the current, therefore, our speed made good will be less than 10 knots. (8.2 knots compute time to steer this leg - 15 minutes).
   f. The next course we wish to make good is 090°T or a right angle from our first leg. Using the same procedure as before, we parallel 090° to point B.

g. From point B, we construct a line to the 10 knot circle in order to give us vector B-c2. From point c2 we construct vector A-c2 by connecting the two points.
h. Now we have vector A-c2 which gives us our course to steer 082° in order to make course 090° T good. The length of vector B-c2 will give us the speed made good on this leg (8.5 knots compute time to steer on this leg - 14 minutes).
i. Our third leg calls for a course of 180° T. We parallel 180° T to point B and, using the same method, construct vector B-c3. From point c3, we can construct vector A-c3. Again vector A-c3 gives us the course to steer in order to make 180° T good (approx. 174°).
j. We now note that by going south on this leg we pick up speed due to the current. Measure the length of vector B-c3 and show this logical speed change to class (11.8 knots). Compute time to steer on this leg (20.5 minutes).
k. Our fourth and final course we wish to make good is 270° T. We parallel 270° T to point B and, using same method, construct vector B-c4. From c4 we draw a line back to the center of the maneuvering board and we now have vector A-c4. We note vector A-c4 gives us a course of 780° T to steer in order to make 270° T good. Again as on the third leg we pick up speed. Show this to class by measuring the length of vector B-c4 (11 knots). Compute time to steer on this leg (22 minutes).
l. The fifth leg will be the same as the first, etc.

4. Use of maneuvering board for solving wind correction for aircraft.
   a. Wind from 120° T velocity 20 knots.
   b. Ships speed 10 knots.
   c. Aircraft speed 130 knots.
   d. Conduct creeping line search utilizing aircraft axis 000° T trackspacing 2 miles.
   e. Give aircraft corrected headings to allow for wind.
5. Draw on blackboard the following example of the problem:
   a.



   b. Using the table for ship-plane search patterns (figure 7-17, CG 308), show how we lay out the above diagram. Instructions on the use of the table follow.
   c. On the far left hand side of this table, we see a scale for aircraft speed. Find 130 knots (aircraft speed for this problem). Using a ruler, construct a line to the next scale to the right (ship's speed) which was given as 10 knots. If you continue this line to long line marked index, this gives us a reference

point with which to continue on. Mark this spot. The next scale to the right of the index line is entitled track-spacing. This information was given to us as 2 miles. Using a ruler, draw a line from our reference point on the index line to 2 miles on the track spacing scale. Continue this line across to the final scale (total pattern width) and we see it cuts this scale at 26 miles. We now have the information that our total pattern width will be 26 miles. However, you will note this last scale indicates length and track spacing (L and s). Therefore, in order to determine the length of each leg, we must subtract our track spacing from 26 miles.

26
-2
24 miles

We then divide this figure in half and come up with two 12 mile legs. Using your example on the blackboard, you can now point out the legs of the creepine line search. 12 miles away from the ship, up 2 miles (your track spacing) and back 12 miles toward the ship. Point out that after every three legs the aircraft will pass directly over the ship.

6. Solving the problem for the aircraft.
   a. Using problem 2 as your reference, we see that the first course the aircraft should make good is 090°T. You first construct the vector A-B indicating the wind's speed along the line of bearing 120°T. (Note its length is one circle or 20 knots - wind from 120.)
   b. Parallel the desired heading we want the aircraft to make good (090°T) to point B. Draw this line to the 130 knot circle and construct vector B-cl. From center of plot (point A) draw vector A-cl. We now see that vector A-cl gives us a course of 095°T to steer in order for the aircraft to make 090°T good. With a divider measure the length of vector B-cl. This gives us the ground speed the aircraft will make good on this heading. (speed 115 knots) Compute the time to fly on this leg (6 minutes). Point out to the class that it will be less than 130 knots due to the fact the aircraft is heading into the wind. Note when using circular slide rule use half the speed of an aircraft and half the distance of the leg to determine the time to fly on each leg. Do this because maximum speed on slide rule is 100 knots, i.e., A/C speed 115 knots; leg 12 miles; 57.5 knots and 6 miles, use time = 6 minutes.
   c. We are now ready for the second leg which we want to be 000°T. Parallel the bearing 000°T to point B. From point B draw this line to the 130 knot speed circle. This gives us vector B-c2. From c2 construct vector A-c2. As before vector A-c2 gives us the course to steer 008°T, and the length of vector B-c2 gives the ground speed which the aircraft will make good. In this case, point out that the aircraft picks up some due to the tail wind. (Speed 140 knots. Compute the time to fly this leg - 1.5 minutes)

d. The last leg we want to make good is 270°. Using the same method as before, parallel the bearing 270°T to point B. From this point extend the line back to the 130 knot circle. This will give us vector B-c3. From point c3 draw a line to point A. This will give us vector A-c3. Vector A-c3 gives us the course of 266°T to steer in order to make 270°T good. The length of vector B-c3 indicates the ground speed the aircraft will make good on this heading. Again point out the increase in speed due to the wind. (145 knots) (4.5 minutes)

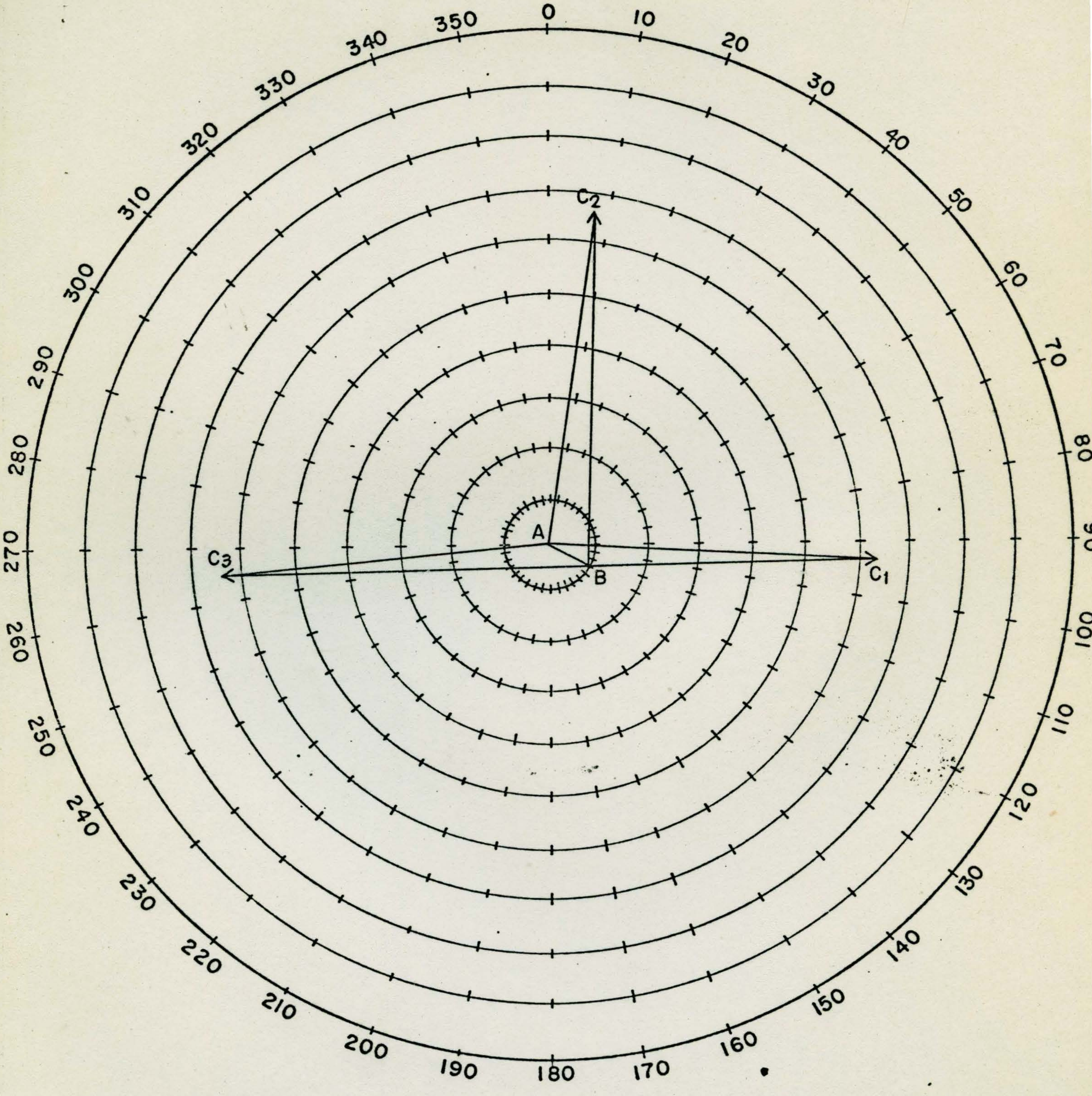
e. We now have completed the problem of solving heading correction for an aircraft.

SUMMARY

a. Go over the first problem stressing the use of each vector and how we obtain them.
b. Point out which legs will be run faster or slower due to current.
c. Explain use of ship-plane search pattern table. (Fig 7-17, CG-308)
d. Use your diagram of creeping line search to explain how the table is used.
e. Review your second problem covering the use of each vector and how we obtain them.
f. Again point out which legs are run faster or slower due to wind.

NUMBER D005

SCALE = 20:1

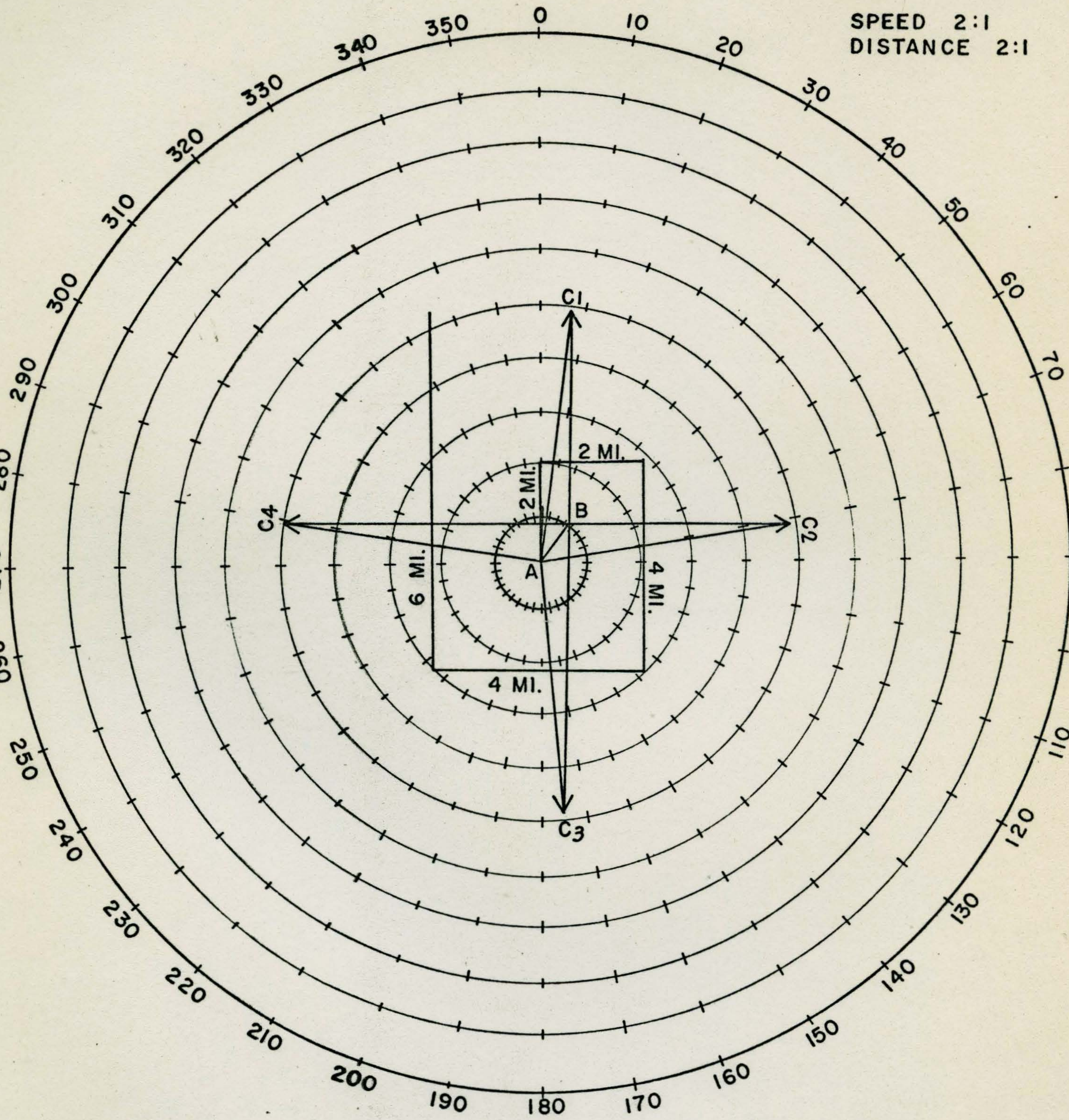


D005

PROBLEM NO. 1

SCALE: 3/8 TO 1

SPEED 2:1
DISTANCE 2:1



TITLE
Determination of Search Areas

OBJECTIVES
To familiarize trainees with the procedures to compute the most probable locale of a distress case.

REFERENCE
1. National Search and Rescue Manual, CG-308

TRAINING AIDS
1. National Search and Rescue Manual
2. Blackboard

INTRODUCTION
Planning a search involves the estimate of the most probable position of a distress incident or its survivors. Regardless of the perfection with which search patterns are carried out, all is for naught unless the survivors are within the area selected for search.

PRESENTATION
1. Factors effecting position.
   a. Initial error in position.
      (1) The probable error in position of an accurate navigational fix is assumed to be
         (a) Ship fix 5 miles radius.
         (b) Aircraft fix 10 miles radius.
         (c) Small craft fix 15 miles radius.
      (2) The probable error in a DR position is assumed to be
         (a) 5 percent of the distance from the last known position for a ship plus the error of that fix.
         (b) 10 percent of the distance from the last known position for an aircraft plus the error of that fix.
   b. Parachute drift.
      (1) An aviator that has bailed out will draft down wind from the altitude that his parachute opened.
      (2) See table figure 6-1 for the distances traveled downwing from different altitudes with different wind velocities.
   c. Survival craft drift.
      (1) Drift consists of the movement of a floating object due to currents (movement of water past a geographical point) and leeway (movement of the object through the water due to wind acting on the object).
      (2) Drift in the open sea is dependent on
         (a) Average sea current.
         (b) Local wind current.
         (c) Leeway.
      (3) Demonstrate the solution of a drift problem using figure 6-7, Drift Computation Sheet.

(4) Local tidal or rotary currents are usually the governing currents in cases close to the coast.

2. Application of factors effecting position to determine total probable error of position.
   a. Initial error of position of incident (X).
   b. Navigational error of search craft (Y).
   c. Drift error (DE).
   d. Total probable error (C).

$$C = \sqrt{di^2 + x^2 + y^2}$$

   e. Work sample problem on blackboard and give trainees practice problems.

3. Determination of search areas.
   a. After determining the most probable position of the survivors and the probable error in computing this, it is next necessary to determine the search area. Initially, the area must be at least large enough to encompass the total probable error of position.
   b. Search radius.
      (1) Search radius is the radius of a circle originating at the most probable position of the target at any specific time (datum point) and having a length equal to the total probable error of position, plus a safety factor to ensure complete coverage.
      (2)

Search	Search Radius
1	1.1c
2	1.6c
3	2.0c
4	2.3c
5	2.5c

note c = total probable error

   c. Repeated expansion.
      (1) The concept of repeated expansion calls for five successive searches with the center of the area of search based on the datum point.
      (2) At the end of each search a new datum point is determined by computing drift for the additional time.

SUMMARY

1. Review factors effecting position and work problems.
2. Review application of factors effecting position to determine total probable error of position and work problems.
3. Review determination of search areas.
4. Review repeated expansion.

TITLE

Administration of Ordnance Material

OBJECTIVE

To familiarize trainees with the importance of the administration part of the gunnery department.

REFERENCE

1. Ordnance Instructions, CG-272

TRAINING AIDS

1. Magazine log.
2. Small arms log.
3. Ammunition record card.
4. Ordnance history cards
5. Battery log (if applicable).

INTRODUCTION

In order to carry out proper material maintenance and to perform properly the duties of a gunnery department, it is necessary that the administration of Ordnance material be carried out effectively. This lesson is intended for enlisted men who may become responsible for ordnance material.

PRESENTATION

1. Ordnance Instructions Publication, CG-272.
    a. Coast Guard Instructions, CG-272, is promulgated as a guide for Coast Guard personnel responsible for ordnance.
    b. Thorough familiarity and compliance with instructions contained in Ordnance Instructions, CG-272, which are applicable are required.
2. General description of logs.
    a. Logs are a daily history.
    b. Routine items should be omitted.
    c. Neatness and thoroughness in filling the log should be induced.
    d. The log keeper should initial each entry.
    e. Only things pertinent to the log should be entered.
3. Magazine log (illustrate with log).
    a. This log is to include a record of all tests and inspections of ammunition.
    b. Magazine temperatures.
    c. General condition.
    d. Also to be included are exposure of ammunition to temperatures above 90°F and procedures to be followed.
4. Small arms log (illustrate with log).
    a. This log is to include all pertinent data on small arms aboard.
    b. Serial numbers of small arms.
    c. Casualties and repairs.

d. Results of inventories and compliance with cleaning instructions.

5. Ammunition Cards, NAVORD Form 2035. (Illustrate with card)
   a. Shall be maintained for all ammunition components at a unit.
   b. One card per lot number.
   c. Shall be filed in a suitable binder or box.
6. Ordnance History Card, NAVORD Form 2032. (Illustrate with card)
   a. Shall be maintained in an up to date and useful manner.
   b. A card is needed for each piece of title A and B ordnance equipment on board.
   c. Space at the top of card will be filled in as indicated.
   d. Bottom half will be completed as indicated. (Refer to page 4-1-6, Ordnance Instructions, CG-272.)
7. Prevention and protection against loss of small arms. (Refer to Ordnance Instructions, CG-272, Chapter 13, page 13-1-1.)
   a. Require a daily check. (Daily check shall be entered in small arms log.)
   b. Issue of small arms be made only on a custody receipt card.
   c. Require positive control for the security of keys for small arms spaces. (Commanding Officer maintain custody of magazine keys and have men draw the keys each morning.)
   d. Commanding Officer designate where small arms may be stowed.
   e. Stowage lockers for small arms shall be made of sturdy material such as oak or metal.
   f. A double lock arrangement using two different keys must be used. This may be locked locker within a locked compartment or two locks on a single door.
   g. Pistol lanyards shall be worn to maintain possession at all times.
8. Security of ordnance keys as prescribed by Commandant Notice 5510 dated 9 August 1965.
   a. Security system consists of a metal key cabinet (12 key capacity or more fitted with a safety hing hasp - one that hides the screws when closed) and locked with a three combination security padlock (one which required a key to change the combination).
   b. For details refer to Commandant Notice 5510 dated 9 August 1965.
   c. Key cabinet is an allowance list.
9. Reports (Ordnance Instructions, CG-272, Chapter 4, page 4-2-1).
   a. Ammunition report (Form CG-2923).
   b. Small arms report (Form CG-2925).
   c. Reports <u>shall not</u> be copied from year to year from file copies. Information entered is always to be taken from an actual inventory.
   d. Instructions for preparation and submission are printed on each form.

10 Ship Armament Inventory List (SAIL), Form 800/19.
(Refer to Appendix B, Article B-21, Ordnance Instructions, CG-272)
   a. SAIL is provided in order to keep the unit informed as to the ORDALTS that have been accomplished or have to be accomplished to the particular weapon at the unit.
   b. Naval Ordnance Publication #00 gives a description of the ORDALTS in order that they can more easily be recognized. By getting the number from SAIL and looking it up in Naval Ordnance Publication #00, you can tell what ORDALTS have or have not been performed. It gives a detailed description of each ORDALT.

11. Proper ammunition storage.
   a. Small arms ammunition should be stowed, preferably in a separate magazine. When this is impracticable, it may be stowed with other approved materials. (Refer to Ordnance Instructions, CG-272, Chapter 8, page 8-3-12)
   b. Pyrotechnic ammunition shall be stowed by itself in regular pyrotechnic stowage places. (Refer to Ordnance Instructions, CG-272, Chapter 8, page 8-3-21.)

<u>SUMMARY</u>

1. Repeat the Instruction.
2. Stress neatness and thoroughness.
3. Log keeper has to initial logs and is responsible for their upkeep.
4. Log entries are to be made on a day-to-day basis.
5. Stress importance in taking daily temperatures, safety in ammunition handling.
6. Take class out and show pyrotechnic locker and small arms locker.

TITLE

U.S. Rifle, Caliber .30, M1

OBJECTIVE

To familiarize trainees with the chief tactical features of the .30 Cal. M1 including capabilities. To acquaint trainees with the basic construction of the .30, M1.

REFERENCE

1. Coast Guardsman's Manual

TRAINING AIDS

1. .30 Caliber M1 Rifle.
2. Blackboard.

INTRODUCTION

The Coast Guardsman is a military man and as such must know how to handle small arms. He is armed with small arms while on guard duty, on special assignments, as a member of a landing party and during civil disturbances. The rifle used in the Coast Guard at the present time is the U.S. Rifle, .30 Caliber, M1 (Garant).

PRESENTATION

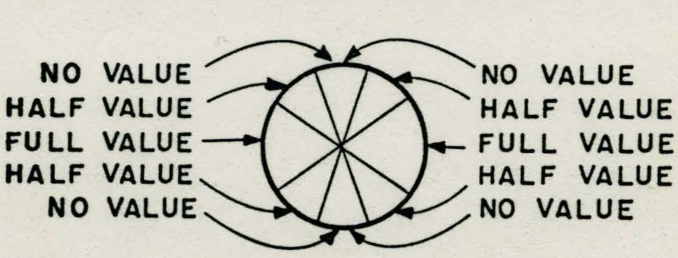
1. Tactical features.
   a. Weight 9.5 lb
   b. Weight with bayonet 11.2 lb
   c. Length (overall) 43.6 in
   d. Length (overall) with bayonet 53.4 in
   e. Trigger pull 5.5 lb min, 7.5 lb max
   f. Approximate maximum range 3450 yd
   g. Maximum effective range 500 yd
   h. Can fire 16 to 24 aimed rounds per minute with a trained rifleman.
2. Description.
   a. The M1 rifle is a clip fed, gas operated, air cooled, semi-automatic shoulder weapon.
   b. Uses a clip containing eight rounds.
   c. Rifle has a fixed front sight and adjusting rear sight.
3. Assembly.
   a. Assembled in three main groups.
      (1) Barrel and receiver groups.
      (2) Stock group.
      (3) Trigger housing group.
   b. To disassemble. (Demonstrate with rifle - if rifles are available, let class disassemble as you demonstrate.)
      (1) Cock the .30, M1 rifle.
      (2) Remove the trigger housing groups.
      (3) Separate stock group from barrel group.

c. Disassembly of the barrel and receiver group.
   (1) With bolt closed remove follower rod and operating spring, do not separate.
   (2) Remove follower arm pin.
   (3) Remove bullet guide, follower arm, and the operating rod catch assembly and lift out together.
   (4) Remove operating rod.
   (5) Remove bolt with rotating motion.

d. Parts of the barrel and receiver group in order of disassembly (show each pice as you name parts).
   (1) Follower rod and operating rod spring.
   (2) Follower arm pin.
   (3) Follower arm.
   (4) Operating rod catch assembly.
   (5) Bullet guide.
   (6) Follower assembly.
   (7) Operating rod.
   (8) Bolt.

4. Ammunition.
   a. Ball. Used against personnel - no marking.
   b. Armor piercing. Used against personnel and light armored vehicles - black tip.
   c. Armor piercing incendiary. Used in place of armor piercing for inflammable target - tip painted aluminum.
   d. Tracer - of serving fire, signalling, incendiary - tip painted orange.
   e. Blank - simulated fire, signalling and firing salutes - no bullet, no crimped.
   f. Dummy - used for mechanical and marksmanship training - three holes in cartridge, no primer, other models have longitudinal flutes along side.

5. Sight adjustment.
   a. The rear sight.
      (1) Knob makes audible clicks.
      (2) Elevation can be adjusted to 0 to 72 clicks.
      (3) Windage has 16 clicks from center to right or left.
      (4) Must estimate wind strength.
      (5) Must know three things, wind direction, velocity and range.
   b. Classification of wind.
      (1) Clock system.
      (2) Classified: full value, half value, no value.



c. Method of estimating wind using a flag.

d. Wind formula (illustrate on blackboard).
   (1) R = Range to target, hundreds yards.
   (2) V = Velocity of wind, miles per hour.
   (3) 15 is a constant figure.
   (4) $\frac{R \times V}{15}$ = number of clicks.
   (5) For half value divide the results by 2.

e. Elevation and windage rule.
   (1) On making corrections, move the sight into the wind.
   (2) One click, one inch per 100 yards.

6. Aiming and firing.
   a. Sight alignment. (Draw on blackboard)
   b. Sight picture. (Draw on blackboard)
   c. Five elements of marksmanship. (Explain in detail)
      (1) Aiming.
      (2) Position.
      (3) Trigger pull.
      (4) Rapid fire.
      (5) Sight adjustment.
7. Safety - Page 347 of FM 23-5.
   a. Rifles will always be treated as if they were loaded.
   b. Rifles will not be carelessly pointed at anyone.
   c. Rifles will be in good condition and clean before firing.
   d. Rifles will be carried with bolts open and safety on.

<u>SUMMARY</u>

1. The M1 is clip fed, gas operated, air cooled and semi-automatic rifle.
2. The M1 is assembled in three main groups (explain).
3. Parts of barrel and receiver group.
4. Five elements of marksmanship.
5. Stress safety (review safety).

TITLE

.30 Caliber Shoulder Line Throwing Gun

OBJECTIVE

To familiarize the crew with general specification, capabilities and to introduce safety when using the shoulder line throwing gun.

REFERENCE

1. Ordnance Instructions, CG-272

TRAINING AIDS

1. Line throwing gun and accessories.
2. Rewinding machine.

INTRODUCTION

The shoulder line throwing gun is an important piece of equipment in that it may be used to pass a line for life saving or routine mooring and for many other uses.

PRESENTATION

1. Describe general specifications using shoulder line throwing gun.
   a. Modified 1903 Springfield/1917 Lee Enfield models (tell which model is applicable)
   b. Smooth bore. (Explain smooth bore.)
   c. Safety and fire lever. (Demonstrate with gun.)
   d. Correct way to hold gun when ready to fire. (Demonstrate)
   e. Two pounds of lead in stock and recoil pad for excessive recoil.
2. Projectiles.
   a. Three types of projectile - 13 oz., 15 oz. and illuminated bouyant projectile. (Show each projectile as you describe them.)
   b b. The 13 oz. is fired from the shoulder, also buoyant projectile.
   c. The 15 oz. is painted RED and fired from a rest.
   d. The 13 oz. projectile will take approximately 350 feet of line.
   e. The 15 oz. projectile will take approximately 475 feet of line.
   f. Standard line used 330 lb. test, 500 ft. spools.
   g. Projectile should slip easily down the bore.
3. Cartridges. (Let class handle a cartridge.)
   a. Use only caliber .30 rifle grenade cartridge M3.
   b. Normal charge is 51 grains smokeless powder and 5 grains black powder.
4. Types of shot line. (Show the types of line.)
   a. Nylon parachute cord, 550 ft. spools. Breaking strength 100 lbs.
   b. Braided waxed nylon cord, 500 ft. spools. Breaking strength 330 lbs.
5. Rewinding machine.
   a. Show proper way to thread line into machine and onto spool.
   b. Show proper maintenance method. (Refer to Ordnance Instructions, CG-272, Chapter 10.)

6. Care and maintenance.
   a. Clean as soon as possible after use.
   b. Use hot soapy water or approved powder solvent. (Hoppes No. 9)
   c. Thoroughly dry all parts and coat with light mineral oil.
   d. Gun should be cleaned daily until no powder residue can be found on patch. (about 3 days)
   e. An occasional drop of linseed oil rubbed into the stock will keep it from cracking.
   f. Do not cover gun with any type of cloth while stowed.
7. Safety precautions.
   a. Projectiles shall be weighted on an accurate scale. 15 oz. projectiles shall be painted red.
   b. In the lid of the shoulder line throwing box, the following legend shall be stenciled: "RED - These projectiles shall not be fired from the shoulder."
   c. No alterations or modifications shall be made to this equipment without permission from Commandant (OOR).
   d. Only approved projectile, ammunition and shot line, as described herein, are to be used with this equipment.
   e. NEVER fire 15 oz. projectile from shoulder.
8. Procedures for firing. (Conduct quarterly test)
   a. See that bore is clean and dry.
   b. Place line in canister so line may run freely from center of coil and through top of canister.
   c. Place a projectile in bore. (If force is necessary, do not use that particular projectile.)
   d. Attach the shot line to the projectile just above the projectile ring by means of at least three loose half hitches.
   e. Hold gun hard against shoulder at a 30° angle.
   f. Put left hand well over the receiver and keep the face away from stock.
   g. Put M3 cartridge into gun and fire.

SUMMARY

1. Safety and fire lever. (Demonstrate)
2. Correct way to hold gun. (Demonstrate)
3. Never fire 15 oz. projectile from shoulder. Should be painted red.
4. Use only approved projectile, ammunition and shot line, as described herein.
5. Use only M3 grenade cartridges.
6. Maintenance should be carried out immediately after firing.
7. Safety precautions should always be observed.

NUMBER E004

TITLE

The Caliber .45 Automatic Pistol

OBJECTIVE

To familiarize trainees with the chief tactical features, capabilities and basic construction of the caliber .45 pistol.

REFERENCE

1. Coast Guardsman's Manual

TRAINING AIDS

1. Caliber .45 pistol.
2. Blackboard drawings.

INTRODUCTION

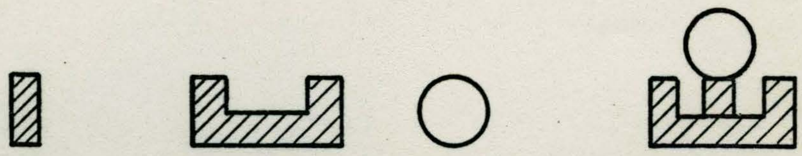
The Coast Guardsman must know how to handle small arms, as he may be required to be armed while on guard duty, on special assignment, as a member of a landing party, or in a war zone. The pistol used in the Coast Guard at present is the caliber .45 automatic pistol M-1911 and M-1911A1.

PRESENTATION

1. Tactical Features.
    a. Weight of pistol with magazine 2.4 lbs.
    b. Weight of loaded magazine (7 rounds) 0.48 lbs.
    c. Weight of empty magazine 0.156 lbs.
    d. Overall length of pistol 9.593 inches.
    e. Trigger pull 5 to 6 1/2 lbs.
    f. Maximum range is approximately 1600 yards at an angle of elevation of 30°.
    g. The rate of fire is limited by the dexterity of the firer to insert the magazine into the pistol, aim, and squeeze the trigger.
2. Description.
    a. Automatic pistols, caliber .45 M-1911 and M-1911A1, are recoil-operated, magazine fed, self-loading hand weapons.
    b. The M-1911A1 pistol is a modification of the M-1911 pistol. The operation of both pistols is the same, and the M-1911A1 differs from the M-1911 in that it consists of five changes.

(1) The tang of the grip safety is extended to provide better protection of the hand.
(2) A clearance cut is made on the receiver for the trigger finger.
(3) The face of the trigger is cut back and knurled.
(4) The mainspring housing is raised in the form of a curve to fit the palm of the hand and is knurled.
(5) The top of the front sight is windened.

c. The pistol is designed to fire caliber .45 ball ammunition.
d. The magazine holds seven cartridges when fully loaded.
e. The pistol has fixed front and rear sights.
   (1) Correct sight alignment. (Draw correct sight alignment on blackboard.)
   (2) Correct aiming. (Draw correct sight picture on blackboard.)



Front sight   Rear sight   Target   Correct sight picture

f. The pistol has two positive safeties and two safety features.
   (1) Positive safeties.
      (a) Safety lock (thumb safety)
      (b) Grip safety
   (2) Safety features.
      (a) Half-cock the hammer
      (b) Disconnector

3. Disassembly for General Cleaning.
   a. Name and point out the three main groups using pistol.
   b. Demonstrate disassembly of the pistol by showing each step and naming each part in the order of which they are removed.
   c. Demonstrate caution to be taken when removing the recoil spring plug.
   d. Recognizing basic parts.
      (1) With parts laid out in the order of disassembly, begin with the first part and write its name on the blackboard.
      (2) Show the part to the class repeating the name verbally.
      (3) Repeat this with each of the parts.

e. Reassembly.
   (1) Reassemble each part in reverse of disassembly showing order in which it is done, and naming each part again.
   (2) Demonstrate caution to be taken when lining up the barrel link with the hole in the receiver, so slide stop can be inserted.
   (3) Demonstrate caution to be taken when replacing the recoil spring plug.

4. Safety precautions. (Instructor follow and demonstrate).
   a. Always unload the pistol if it is to be left where someone else may handle it.
   b. Always point it when snapping it after examination.
   c. Never place the finger within the trigger guard until you intend to fire or snap the hammer.
   d. Never point the pistol at anyone you do not intend to shoot nor in any direction if an accidental discharge may do harm.
   e. Before loading the pistol, inspect the bore and chamber to see that it is not obstructed.

<u>SUMMARY</u>

The three main groups are: (1) Barrel, (2) Slide, (3) Receiver.
The two positive safeties and two safety features are:

a. Safety lock (thumb safety)	a. Half cock of the hammer.
b. Grip Safety	b. Disconnector

Review the safety precautions to be followed when handling a pistol. Stress caution to be used when removing and replacing recoil spring plug and replacing the slide stop.

NUMBER E005

TITLE

The .50 Caliber Browning Machine Gun (HB) M2

OBJECTIVES

To familiarize the trainees with the chief tactical features, basic construction, ammunition, and safety precautions related to the gun and ammunition.

REFERENCES

1. OP-1618, .50 Cal. Browning Machine Gun M-2
2. IPB-5325, .50 Cal. Browning Machine Gun M-2
3. FM 23-65, Browning Machine Gun, .50 Cal., HB M-2
4. TM 9-1225, Browning Machine Gun, .50 Cal., Cell Types
5. TM 9-1900, Ammunition General
6. TM 9-2021, .50 Cal. Machine Guns (Cell Types)
7. TM 9-1005-213-34, .50 Cal. Machine Gun Maintenance Manual
8. TM 9-213-12P, .50 Cal. Machine Gun Repair Parts Manual

TRAINING AIDS

1. .50 Caliber Browning Machine Gun (if available).
2. Blackboard.

INTRODUCTION

The .50 Caliber Browning Machine Gun is used on Coast Guard patrol boats for law enforcement and may be manned by any member of the crew; therefore, every Coast Guardsman should be familiar with its capabilities and basic construction as he may be required to operate the gun when stationed on these units.

PRESENTATION

1. The Browning Machine Gun, .50 Cal. HM M-2, is a belt fed, recoil operated, air cooled weapon.
   a. The gun is capable of semiautomatic fire as well as automatic fire.
   b. Chief tactical features are:
      (1) Rate of fire 450 to 555 rounds per minute.
      (2) Maximum range (M2 ball) 7,400 yards.
      (3) Maximum effective range 2,000 yards.
      (4) Weight (less mount) 84 pounds.
      (5) Overall length, 65 inches.
2. Basic Construction.
   a. Major groups in construction are:
      (1) Barrel and barrel extension group.
      (2) Receiver group.
      (3) Cover group.
      (4) Oil buffer assembly and oil buffer body group.
      (5) Bolt and driving spring group.
      (6) Backplate group.

b. The gun is designed so that ammunition may be fed from either the right or left side of the receiver by changing the feed mechanism.
c. The gun is constructed with a leaf type rear sight.
    (1) Graduated in both yards and mils for ranges from 100 to 2600 yards and 0 to 62 mils.
    (2) A windage knob permits deflection changes of 5 mils right or left of the center.
d. The gun is constructed with a semi-fixed blade type front sight with cover.
e. The gun fires fixed ammunition which is linked together by a disintegrating metallic link belt.
f. The gun is manually trained and elevated.
    (1) If no positive stops are installed the gun can be trained through 360 degrees.
    (2) Limits of depression and elevation vary, depending on where positive stops are located on the mount, for various types of vessels.

3. Ammunition.
    a. Ammunition used with the .50 Cal. Browning Machine Gun is:
        (1) Fixed ammunition.
        (2) Classified as small arms ammunition.
    b. .50 Cal. cartridges come linked together in metallic link belts of various amounts, depending on which type container they are packed in.
    c. .50 Cal. cartridges are of various types and identified by the color of the bullet tip. (Show color chart, page 13 of TM 9-1900.)
        (1) Types of .50 Caliber ammunition are:
            (a) Ball, M2.
            (b) AP, M2, armor piercing.
            (c) API, M8, armor piercing incendiary.
            (d) API-T, M20, armor piercing incendiary tracer.
            (e) INC, M1, incendiary.
            (f) INC, M23, incendiary.
            (g) TR, M1, and M21, tracer
            (h) TR, M10, tracer.
            (i) TR, M17, tracer.
            (j) Dummy drill.
        (2) Not all types of ammunition listed are used in the Coast Guard.
        (3) Usually the ammunition is linked with the various types in ratio.
        (4) Never allow dummy drill cartridges to become mixed with live cartridges.

4. If time allows, disassemble and reassemble the gun, naming each part and function while doing so. (Follow steps listed in Chapter 2 of FM 23-65). If time does not allow, disassemble and reassemble during routine maintenance periods. (Stress all safety procedures to be followed during each step.)

5. Safety precautions.
    a. Make sure the head spacing is correct and the timing is properly set.
    b. Check the gun for proper assembly.
    c. Handle all misfires or stoppages carefully and quickly.
    d. Keep the gun on target whenever loaded or during uncontrolled automatic fire (runaway gun).
    e. Never coat the gun parts or bore of the barrel with heavy grease.
    f. Be sure to always inspect the bore for obstruction before attempting to fire.
    g. Never use unidentified types, lots, or unknown grades of ammunition.
    h. Keep all ammunition dry and stowed in a ventilated space.
    i. Never oil or grease small arms ammunition.
    j. Protect the primers from being struck by sharp objects.
    k. Keep all cartridges clean and protected from mud, sand, dirt and water.

SUMMARY

1. The .50 Cal. Browning Machine Gun is a belt fed, recoil operated, air cooled weapon with a high rate of fire.
2. The gun is semiautomatic as well as automatic, and is effective at long ranges.
3. Ammunition can be fed from either side of the receiver by changing the feed mechanism.
4. The gun has an adjustable rear sight, and a semi-fixed blade type front sight.
5. The gun fires fixed type ammunition which is classified as small arms ammunition.
6. The gun is manually trained and elevated.
7. Ball, tracer, armor piercing, and incendiary are the most common types of ammunition used with this gun.
8. Review safety precautions.

TITLE
The 20 MM Anti-Aircraft Machine Gun

OBJECTIVE
To acquaint the trainees with the 20 MM machine gun's chief tactical features, description, basic general construction, and the ammunition it uses.

REFERENCES
1. OP-911, 20 MM Machine Gun Mechanism MK4.
2. IPB-5350, Illustrated Parts Breakdown.

TRAINING AIDS
1. 20 MM Machine Gun Mechanism (if available).
2. Movie, MN 1547C, Duties of the 20 MM Gun Crew.
3. Blackboard.

INTRODUCTION
As the Coast Guard has many small ships which mount 20 MM Machine Guns every Coast Guardsman must have a basic knowledge of the weapon as he may be required to serve in the gun crew during routine law enforcement patrols or on patrol in a war zone.

PRESENTATION
1. Tactical features.
   a. Fires fixed ammunition from a magazine having a capacity of 60 rounds.
      (1) Magazine weight when loaded, 63 pounds.
      (2) Magazine weight when empty, 31 pounds.
   b. Firing rate, cyclic, 450 rounds per minute.
   c. Firing rate, magazine loading 250 to 350 rounds per minute.
   d. Muzzle velocity, 2470 feet per second.
   e. Maximum range, 4800 yards at 45 degree elevation.
   f. Effective range, 1200 to 1500 yards.
2. Description.
   a. The 20 MM machine gun assembly is an anti-aircraft machine gun mounted on a MK 10 free swinging mount.
      (1) Depression limit is 15 degrees.
      (2) Elevation limit is 90 degrees.
      (3) Train limit is 360 degrees.
   b. The principle of operations is "blow-back".
   c. The gun consists of three main groups.
      (1) The gun barrel.
      (2) The machine gun mechanism.
      (3) The shoulder rest and hand guide.
   d. The sight and magazine are considered as supplementary units required to complete the assembly.

3. Construction. (Show trainees 20 MM gun)
   a. The major difference between this gun and others is that the force of the explosion is absorbed in checking and reversing the forward movement of a relatively heavy blot, or breech blocks that are never locked. In most guns, the force of explosion is taken by the locked breech block and by the recoil cylinders and mechanisms.
   b. The gun fires automatically as long as the trigger is pressed and there is ammunition in the magazine.
   c. When the last round is fired in a magazine, the trigger mechanism is returned automatically to the cocked position regardless of the position of the trigger. This feature prevents the breech block from counterrecoiling on an empty gun after the last round is fired. Since there is no round firing to reverse the breech block, re-cocking by hand would be necessary before firing could be continued.
   d. A "Safe/Fire" lever is fitted close to the right hand grip. (Show trainees the "Safe/Fire" lever on the gun or the picture. Figure 32, page 46 in OP-911.)
      (1) Stress that the lever is always put on safe after each cease fire or casualty.
   e. Important features in construction are:
      (1) The breech casing and barrel are fixed in place and do not recoil (Point out to T/E's on gun).
      (2) The major recoiling parts are: (Point out to T/E's on gun).
         (a) The breech bolt.
         (b) The breech block.
         (c) The cotter.
         (d) The two breech bars.
         (e) The barrel spring case.
4. Types of 20 MM ammunition used in the Coast Guard.
   a. BL&P, blind loaded and plugged projectile.
   b. BL&T, blind loaded and tracer type projectile.
   c. HET, loaded and fuzed projectile with tracer.
   d. HEI, loaded and fuzed projectile without tracer.
   e. Dummy drill, projectiles are inert, and the cartridge case has holes drilled in it and has no primer. (Used for drill loading of magazines.) (Show a dummy drill round to trainees as available and stress that it is never to be stowed with live ammunition.)
   f. AP, armor piercing projectile. (Not in CG use.)
   g. APT, armor piercing projectile with tracer. (Not in CG use.)
5. Projectial colors for identification of types of 20 MM ammunition.
   a. BL&P, dark grey green.
   b. BL&T, dark grey with 1/8 inch yellow band.
   c. HET, light grey.
   d. HEL,red.
   e. Dummy drill, seal brown.
   f. AP, black.
   g. APT, black, with 1/8 inch yellow band.

TITLE
The 81 MM Mortar, MK 2 MOD 0

OBJECTIVE
To familiarize the trainees with the chief tactical features, basic construction and major components, ammunition, and the safety precautions pertaining to the 80 MM mortar and ammunition used.

REFERENCES
1. NAVWEPS OP-5, Ammunition Ashore, Vol. 1.
2. NAVWEPS OP-1014, Ordnance Safety Precautions.
3. NAVWEPS OP-1743, The 81 MM Mortar, MK 2, MOD 0.
4. NAVWEPS OP-3183, Range Table for 81 MM Projectiles.

TRAINING AIDS
1. 81 MM Mortar, MK 2 MOD 0 (if available).
2. Blackboard.

INTRODUCTION
The 81 MM mortar, MK 2 MOD 0, which has been adopted by the Coast Guard has proven to be very effective on the Coast Guard patrol boats which are primarily using the weapon for shore bombardment in Viet Nam. Every Coast Guardsman should be thoroughly familiar with this weapon because he may be assigned as a member of the mortarcrew when stationed aboard any one of these units.

PRESENTATION
1. The chief tactical features of the 81 MM mortar MK 2 MOD 0 are:
   a. The 81 MM mortar is tripod mounted and uses Army ammunition.
   b. It has a recoil-counterrecoil mechanism for reducing brake load.
   c. It is designed for free-winging in either train and elevation for quick changes in direction or a fixed firing position.
   d. It has two types of fire:
      (1) Drop-fire.
      (2) Controlled trigger fire.
   e. Limits of elevation and depression.
      (1) It can be elevated to 71 degrees, 30 minutes above horizontal.
      (2) If no positive stops are installed, the weapon can be depressed to 30 degrees below the horizontal.
   f. If there are no positive firing stops installed, the weapon may be trained through 360 degrees.
   g. Mount dimensions.
      (1) Total weight of mortar, 593 pounds.
      (2) Over-all length, 65.125 inches.

(3) Height to centerline of barrel 33 inches.
(4) Line-of-sight limits.
    (a) Total arc, sight angle, 75 degrees.
    (b) Total arc, deflection, 500 mils.
    (c) Left and right limits, 250 mils.
(5) Length of recoil, 8 inches.

2. Construction and major components.
   a. The 81 MM mortar is of simple construction and can be operated and fired by one man, though two usually perform these duties.
   b. The mortar is constructed with two manually operated clamping levers for locking the mount in train and elevation.
   c. A basket arrangement at the rear of the breech to prevent injury to the operator from recoil action.
   d. The mortar consists of six major components:
      (1) Barrel.
      (2) Breech mechanism.
      (3) Slide.
      (4) Carriage.
      (5) Stand.
      (6) Sight.
   e. Component arrangement.
      (1) The barrel, a smooth bore tube, and the breech mechanism are supported in a slide and secured to a recoil unit.
      (2) The main unit of the breech mechanism is a cast steel housing on the breech end of the barrel.
          (a) It has a recoil lug at the top.
          (b) A case-enclosed firing mechanism centered on its rear face.
              1. The firing mechanism is manually cocked.
              2. Has a trigger operated percussion firing pin.
      (3) The slide is a trunnion pivoted mortar cradle with cylindrical liners and longitudinal key alining and supporting the barrel.
          (a) Recoil and counterrecoil mechanism is located on top of the slide.
          (b) An elevating arc and elevation clamping lever are mounted at the left trunnion.
      (4) The carriage is a Y-shaped weldment with:
          (a) Horizontal trunnion bearings for the slide.
          (b) A verticle pintle for the stand.
          (c) Train clamping levers that engage a slewing ring to the stand.
      (5) The stand is a tripod weldment of tubular stock with:
          (a) A large brushed bearing for the carriage at the top.
          (b) Deck bolt pads arranged at the bottom for mounting to the deck.
      (6) The sight is an open yoke-type mounted on the left side of the slide.

(a) It is manually adjusted arrangement.
(b) It has offset limits of 14 degrees 20 minutes deflection, right and left, and 75 degrees sight angle.
(c) The sight is equiped with a lighting circuit which illuminates the deflection and sight scales.

3. Ammunition.
a. Ammunition for the 81 MM mortar is classified as "semifixed complete" since the propelling charges may be varied in number to vary thr rounds.
(1) All rounds except the MK 68 training cartridges are issued in the form of fuzed complete rounds.
(2) All rounds except the training cartridges have four main components:
(a) Fuze.
(b) Body.
(c) Filler.
(d) Fine assembly.
(3) All of the cartridges have the same general characteristics.
b. Identification of mortar cartridges is provided by markings on the projectiles and containers according to a color scheme.
(1) High explosive, olive drab with yellow markings.
(2) Smoke, gray with yellow band and yellow markings.
(3) Illuminating, gray with white markings.
(4) Practice, blue with white markings.
(5) Training, black with white markings
c. Additional information pertaining to the cartridge is included on the ammunition data card packed with them.
d. Information stencilled on each cartridge consists of:
(1) Caliber of mortar in which fired.
(2) Kind of filler.
(3) Model of cartridge.
(4) Ammunition lot number.
e. Cartridges are assembled with three types of fuzes:
(1) Point denotating.
(2) Time.
(3) Proximity or variable time (VT).
f. Fuzes used with 81 MM cartridges are considered boresafe. (Never disassemble fuzes aboard ship as it is dangerous and also prohibited.) (Do not fire cartridges fitted with M52-Series, M82-Series, and M519-Series fuzes over the heads of friendly troops.)

4. Safety precautions.
a. Smoking is prohibited in the vicinity of the mortar when the mortar is manned for firing.
b. Never use heavy grease for coating the mortar bore. (Use a film of light oil.)
c. Never place fingers or thumbs of either hand in front of the mortar muzzle.
d. The loader must use asbestos gloves if the mortar is hot.

e. Never attempt to remove a misfired round until the mortar has been cooled with water to prevent a cook-off.
f. Wait at least 30 minutes before approaching or disturbing a dud round after a misfire.
g. Never strike the primer of the ignition cartridge against hard objects such as belt buckles.
h. Do not attempt to fire rounds or fuzes that have been chopped three feet or more unless they have been inspected and certified by qualified personnel.
i. Keep cartridges from becoming wet at all times, as short and variable ranges will result from this and excessive lubricant or solvent in the bore of the mortar.

SUMMARY

1. The 81 MM mortar is a free-swinging mount which is used for shore bombardment, laying smoke screens, and to illuminate objects at night.
2. The mortar has trigger controlled fire and drop fire, and is usually manned by two persons, even though one man can operate and fire it.
3. The mortar consists of a barrel, breech mechanism, slide, carriage, stand, and sight.
4. The mortar is a muzzle loading type which uses Army type ammunition that is classified as "semi-fixed complete".
5. Review safety precautions.

TITLE
Ammunition Handling

OBJECTIVES
To familiarize the trainees with the basic procedures, handling, stowage requirements, and general safety precautions to be followed when handling ammunition.

REFERENCE
1. Coast Guardsman's Manual

TRAINING AIDS
1. Blackboard.
2. Safety Precaution Signs (as available).
3. One round of each type drill ammunition (as available).

INTRODUCTION
As ammunition handling is an all hand evolution in the Coast Guard, every Coast Guardsman should be familiar with the procedures, policies, and safety precautions which are to be carried out and followed.

PRESENTATION
1. Procedures.
   a. Standard operating procedures shall be prepared for all hazardous operations and shall be approved by competent authority before operations begin.
      (1) Procedures shall be discussed with all personnel concerned.
      (2) Procedures shall be posted at the work site.
      (3) When procedures are long and involve many steps - a check-off list should be used.
   b. Supervisors shall be assigned to all operations.
      (1) Only careful, reliable, mentally sound and physically fit persons are permitted to work with or handle explosives and ammunition.
      (2) All safety precautions are taken and followed.
      (3) All safety devices are operative and in good condition.
      (4) Only the minimum number of persons required for the operation are allowed in the vicinity of handling or loading operations.
      (5) Prompt reporting of accidents, involving explosives and ammunition where material damage or personnel injuries are sustained.
      (6) No matches, lighters, sparking or flame producing items are permitted in the area.

(a) Smoking is not permitted.
(b) Firefighting equipment is readily available.
(c) Ground straps are used and inspected periodically, if necessary.
(d) Slings, crane cables, hoisting cables, and other handling equipment has been tested and inspected.

2. Handling.
   a. Except in cases of emergency, ammunition shall not be handled or transferred during fueling operations.
   b. Handle projectiles and other ammunition with approved handling equipment when available.
      (1) Dunnage shall be laid down if it is necessary to roll explosives by hand.
      (2) They must not be allowed to bump each other, may arm fuzes or cause damage.
   c. Protection of fuzes, and primers, or leaking and damaged ammunition containers.
      (1) Do not allow fuzes or primers to be struck or scratched while handling.
      (2) Do not handle leaking and damaged ammunition containers unnecessarily. Set them aside and notify the supervisor.
      (3) Do not disturb safety pins or other devices requiring removal before flight or firing.
3. Stowage.
   a. Ammunition, explosives, and explosive components should be stowed in places specifically designed for each type. (For stowage of compatible articles, show shart of permissible stowages, table 2, page 429, OP-4 (Vol II) (3rd Rev.).
   b. Ammunition, explosives, and explosive component stowage.
      (1) Type.
      (2) Lot number.
      (3) Grade.
      (4) Index number.
   c. Ammunition, explosives, and explosive components should be stowed:
      (1) In clean, dry, well vented spaces.
      (2) In spaces which are equipped with sprinkler systems.
      (3) In spaces which can be locked securely.
      (4) In spaces equipped with maximum and minimum temperature thermometers.
   d. Ready service stowage.
      (1) Ammunition should only be stowed in ready service boxes when needed at the weapon, or no other stowage space is available.
      (2) Precautions shall be taken to prevent exposure of material stowed in ready service boxes.
      (3) Ready service boxes must be equipped with maximum and minimum temperature thermometers.

e. Maximum and minimum temperatures shall be taken and recorded daily in each magazine, stowage space, and ready service box.

4. General safety precautions.
   a. Never smoke in the vicinity of ammunition or explosives, or when it is being handled.
   b. Keep pyrotechnic ammunition stowed separately from other types of ammunition.
   c. Never handle ammunition carelessly.
   d. Do not allow ammunition or its components to become wet.
   e. Never expose more ammunition than that which is to be used.
   f. Do not attempt to disassemble any type of ammunition or explosive.
   g. Use only the type of ammunition in a weapon for which it is designed.
   h. Do not open sealed containers of ammunition until it is ready to be used.
   i. Dispose of damaged ammunition or explosives in accordance with current instructions.
   j. Do not stow dummy drill and live ammunition together.
   k. Stay alert and never become over-confident while handling ammunition, explosives, and explosive components.

<u>SUMMARY</u>

1. Procedures shall be discussed with personnel concerned, and followed at all times when ammunition is being handled or transferred.
2. Supervisors shall be alert and be familiar with their duties.
3. Handling of explosives and ammunition shall be avoided unless necessary.
4. Only proper equipment should be used to handle explosives.
5. All safety precautions must be observed and followed at all times.
6. Ammunition, explosives, and explosive components must be properly stowed according to their type, lot, grade, and index number.

TITLE

Pyrotechnics

OBJECTIVE

To familiarize trainees with types used in the Coast Guard, their use, characteristics, identification, and safety precautions used when handling and firing.

REFERENCE

1. CG-272, Ordnance Instructions

TRAINING AIDS

1. Actual Pyrotechnic items covered (as available).
2. Pictures of each item covered (shown in OP-2213).

INTRODUCTION

Every Coast Guardsman must know how to use and identify pyrotechnics because, at times, he may need the knowledge when signaling for assistance, or when engaged in search and rescue.

PRESENTATION

1. Very signal light MK2 Model 0.
   a. The signal light is primarily used for distress signaling.
   b. It is a cartridge-type signal resembling a 10 gage shotgun shell and is used in both a MK III and MKV, very signal pistol.
      (1) Never point a Very pistol at anyone nor at any object.
      (2) Never fire any ammunition in a Very pistol, other than that for which it is designed.
      (3) Since the pistol is cocked at all times when the breech is closed, consider it as loaded until opened and found not to be.
   c. Characteristics.
      (1) Length 2.43 inches.
      (2) Diameter 0.88 inches.
      (3) Weight 1.1 ounces.
      (4) Burning time 6 seconds.
      (5) Candle power.
         (a) Red 300.
         (b) White 250.
         (c) Green 600.
      (6) Height of rise 200 feet.

d. Colors and identification of Very signal lights (show picture on page 83, OP-2213).
   (1) Red Very signal light.
      (a) Day identification, paper case of the cartridge is the same color as the star.
      (b) Night identification, closing is wad is ridged for a red star.
   (2) White Very signal light.
      (a) Day identification paper case of the cartridge is the same color as the star.
      (b) Night identifiation, closing wad has a conical projection in the center for a white star.
   (3) Green Very signal light.
      (a) Day identification, paper case of the cartridge is the same color as the star.
      (b) Night identification, closing wad is smooth for the green star.
e. Handling and safety precautions.
   (1) Keep Very signal lights dry and stowed separately from other types of ammunition.
   (2) Never disassemble a Very signal light.
   (3) Never fire a Very signal light in any weapon other than those it was designed for use with.

2. Day and Night distress signal MK 13 Model 0.
   a. This signal is especially adapted for use by aircraft personnel downed at sea.
   b. This signal is also used for life rafts and lifeboats as survival equipment.
   c. The MK 13 Model 0 Day and Night distress signal is a combination signal for day or night use.
   d. Characteristics.
      (1) Length, 5.19 inches.
      (2) Diameter, approximately 1 1/2 inches.
      (3) Weight, 6.4 ounces.
      (4) Burning time.
         (a) Flame, 18 seconds.
         (b) Smoke, 18-20 seconds.
      (5) Candle power, 3000.
      (6) Color.
         (a) Flame, Red.
         (b) Smoke, Orange.
      (7) Each section of the signal is waterproofed and each section is heat-insulated from the other.
      (8) The signal is designed to be held comfortably in the bare hand while it is functioning.

f. Handling and safety precautions.
    (1) Never attempt to ignite both ends of the signal at the same time.
    (2) Do not handle the signal roughly.
    (3) Hold the signal properly to prevent drippings from hitting the hand.
    (4) Hold the signal pointing away from the body at a 30° angle, downwind from yourself.

3. High altitude parachute flare MK 20 Model 0.
    a. The high altitude parachute flare is used to illuminate and identify objects at night.
    b. It is also used to identify and illuminate a ditch point for a plane being forced to land at sea.
    c. It is fired from a projector MK 13 Model 0.
    d. Characteristics.
        (1) Length, 10.75 inches.
        (2) Diameter, 2.4 inches.
        (3) Weight, 5 pounds.
        (4) Burning time, 1 minute.
        (5) Candle power, 85,000.
        (6) Height of projection, 1000 feet.
        (7) Rate of fall, 16 feet per second.
    e. Identification (show pictures on page 14 & 15 of OP-2213).
        (1) The high altitude parachute flare MK 20 Model 0 is contained in a medal can and it is opened with a key attached to the base of the can.
        (2) All identification markings are stenciled on both the flare and container.
    f. Safety precautions.
        (1) A suitable barrier should be erected to protect personnel firing flares from the MK 13-0 projector.
        (2) Firing personnel should wear steel helmets as protection against falling empty cases.
        (3) In case of a misfire, a hang-fire must be suspected, and it is necessary to wait at least three minutes before approaching the projector.
            (a) Unscrew the barrel from the base after three minutes.
            (b) Remove the misfired flare from the barrel and drop overboard.
        (4) After removing the misfired flare from the barrel, both the barrel and base should be cleaned as a precaution against further misfires.
        (5) Handle flares with extreme caution after they have been removed from the container. (Do not drop unpacked flares.)

4. Depth Charge Marker MK 1 Model 2 - Day.
   a. The depth charge marker MK 2 Model 2 is used to aid navigation at day.
      (1) The marker provides a stationary reference point on the surface of the water for determination of the drift of an airplane.
      (2) The marker is used to mark the initial point of contact with a submarine.
      (3) The marker is used to provide a reference point for further search.
      (4) The marker is used to determine wind direction before landing.
   b. The depth charge marker MK 1 Model 2 - Day, may be launched by hand from the decks of surface vessels or from aircraft at any altitude.
   c. Characteristics.
      (1) Weight, 3.6 pounds.
      (2) Maximum release altitude, 1000 feet.
      (3) Color, Yellow-Green.
      (4) Material, Fluorescent dye.
      (5) Visibility.
         (a) Surface, 3000 yards.
         (b) Air, 10,000 yards.
   d. Identification (Show pictures on pages 25-27 in OP-2213).
      (1) The depth charge marker MK 1 Model 2 - Day, is packed in a cardboard container with metal ends.
      (2) The marker is stenciled with nomenclature and other pertinent information and, in some cases, instructions for launching or use.
   e. Handling and safety precautions.
      (1) Markers are very fragile and subject to breakage, so they should be handled carefully at all times.
      (2) Markers must be stowed in a dry place, because slick-producing materials are subject to deterioration when in contact with moisture.
      (3) All markers must be stowed out of the direct rays of the sun in a place where temperatures does not exceed 100°F.
5. Depth Charge Marker MK 2 Model 0 - Night.
   a. The depth charge marker MK 2 Model 0 night is used to aid navigation at night.
      (1) The marker is used to indicate the initial point of contact with submarines.
      (2) The marker is used to provide a reference point for further search and attack during night operations.
      (3) The marker is also used to mark a sea lane for ditching aircraft at night.

b. The depth charge marker MK2 Model 0 - night may also be launched by hand from the decks of vessels or from aircraft at altitudes up to 3000 feet.

c. Characteristics.
   (1) Weight, 3 pounds.
   (2) Maximum release altitude, 3000 feet.
   (3) Ignition delay, 70-90 seconds.
   (4) Burning time, 45-55 minutes.
   (5) Candle power, 150.
   (6) Flame color, yellow.
   (7) Visibility.
      (a) Surface, 4 miles.
      (b) Air, 10 miles.

d. Identification (Show pictures on pages 28-29, OP 2213).
   (1) The depth charge marker MK 2 Model 0 - Night is a copper cylindrical shaped can with a pull ring attached to a tear strip at each end.
   (2) The marker has a label attached which lists nomenclature and other pertinent information and, in some cases, instructions for launching or use.

e. Handling and safety precautions.
   (1) Stow this marker separately from other pyrotechnics if practicable.
   (2) Do not stow this marker in a compartment equipped with sprinklers.
   (3) Do not handle the marker or remove it from its container by grasping the tear strip pull ring.
   (4) Do not remove the tear strip until just prior to use.

6. Safety precautions.
   a. Stow all pyrotechnics separately from all other types of ammunition or powder.
   b. Stow pyrotechnics in a dry, ventilated place.
   c. Do not smoke or carry lighted cigars, cigaretts, or pipes in the vicinity of pyrotechnics.
   d. Do not stow pyrotechnics where direct rays of the sun can strike them or where the temperature rises above 100°F.
   e. Keep all pyrotechnics stowed in a dry place on weather decks.
   f. Do not break the seal of pyrotechnic packings until just before the item is to be used.

SUMMARY

The most commonly used pyrotechnics in the Coast Guard are:

a. The signal light MK 2.
b. Day and night distress signal MK 13 Model 0.
c. High altitude parachute flare MK 20 Model 0.
d. Depth charge marker, MK 1 Model 2.
e. Depth charge marker, MK 2 Model 0.

Review the uses of each type and review the characteristics of each type. Describe and show pictures of each type (pictures in OP-2213). Cover the general safety precautions on all pyrotechnics.

NUMBER F001

TITLE
Oxygen Breathing Apparatus

OBJECTIVES
1. To acquaint the trainee with the oxygen breathing apparatus found in service and the differences.
2. To teach the trainee how to use the OBA.
3. To teach the proper stowage of the OBA.
4. To tell the trainee of the safety precautions involved.

REFERENCE
1. Instruction Material as available in Unit library.

TRAINING AIDS
1. Different type OBAs on board.
2. Cannisters.
3. Other equipment in OBA box.
   a. Wrench.
   b. Eye covers.
   c. De-fogging ointment.
4. Blackboard.

INTRODUCTION
Having the knowledge of the principle of operation and knowing how to put it into use is a must to not only the designated OBA men but to all hands for the purpose of self protection while combating fire aboard ship.

PRESENTATION
1. There are four types of OBAs in use in the Coast Guard.
   a. The "A-1".
   b. The "A-2" (converted).
   c. The"A-3" (early and late model).
2. The four types of breathing devices use a cannister of chemicals to generate oxygen for the wearer and purifies the exhaled air.
3. Naming the parts using the OBA.
   a. Face piece (including eye piece, head straps, mouth piece and air ways to eye pieces).
   b. T-tube with starter valve, inhalation and exhalation valve.
   c. Inhalation (left and exhalation (right) tubes.
   d. Cannister holder, cannister stop and bail.
   e. Breathing bags and cooling tubes.
   f. Shoulder harness and waist strap.
4. Differences in the four types are:
   a. Type A-2 (used only if converted) remains a closed system when cannister is removed.
      (1) Is designed to permit cannister changing in smoke filled compartment.
      (2) Identified by rubber boot at bottom of main valve.

(3) After conversion cannister must be changed in clean atmosphere.

b. A-1 and A-2 use heat absorbent process, aided by wire mesh tubes inside breathing bags. Cools air to 120°.
   (1) A-3 has rubber corrigated tubes of larger diameter and perforated holes. Cools air to 80°.
c. A-1 and A-2 have large eye pieces.
   (1) A-3 have large eye pieces.
   (2) A-3 (late) have two warning bells. One sounds 15 minutes before time is up. Second when time is up.
d. Show difference in types using OBAs available.

5. Cannisters; three types. All contain chemicals which, when the exhaled air is forced through them, generate 95% pure oxygen.
   a. Gray cannisters and green cannisters with one candle must be activated with 15 breaths or until bottom of cannister is warm.
   b. Green cannister can be activated by pulling lanyard to clorate candle.
      (1) Provides immediate supply (10 liters) of oxygen.
      (2) Supply will last for approximately 3 minutes or until cannister begins to operate.
   c. Gray cannisters.
      (1) Have no candles.
      (2) Must be activated as stated (15 breathes).
6. Steps in doning apparatus (have trainee put it on).
   a. Adjust shoulder harness.
   b. Insert head between shoulder straps and fasten to "Q" rings.
   c. Fasten waist strap and adjust.
   d. Loosen head harness and insert under shoulder strap out of way.
   e. Remove cap and seal from cannister. Insert, concave side toward body.
   f. Let candle cap and lanyard hang outside of bail.
   g. Swing bail down and turn hand wheel clockwise.
   h. Push cannister stop in all the way, continue turning hand wheel until cannister gasket is firmly seated.
   i. Set timer to 30 minutes.
   j. Holding head harness in one hand and T-tube assembly in other, insert chin into face piece.
   k. Pull harness over head and tighten straps two at a time starting with chin straps.
   l. Test for tightness by holding breathing tubes and inhale.
   m. To activate cannister
      (1) Inhale while holding breathing tubes and depressing starter valve.
      (2) Release breathing tubes and starter valve and exhale (repeat two times).
      (3) Depress starter valve, force air out of bags.

(4) Repeat steps 1 through 3 four times.
(5) Feel bottom of cannister for warmth.

n. To activate cannister with candles after face piece is on, have cannister seated.
   (1) Pull lanyard away from body.
   (2) Candle will ignite releasing pure oxygen.

7. Safety precautions.
   a. Never hold OBA by T-rube assembly. Will cause breaks in breathing tubes.
   b. Clean inhalation, exhalation valves and face piece after each use.
   c. Do not ignite candle before
      (1) Removing cap and seal.
      (2) Cannister is seated.
      (3) Face piece is tight.
   d. Handle used cannisters with gloves.
   e. Punch holes in top before discarding in clean bucket of water.
   f. Prevent contact of chemicals to skin and eyes.
      (1) If this happens wash immediately with fresh water.
   g. Keep cannister (new and used) away from all forms of grease and oil. Will cause explosion!
8. Stowage of OBA and related equipment.
   a. Safety line; coil of 12" diameter in bottom of box.
   b. Gloves, two pair, one rubber for tender, one asbestos for OBA man on top of safety line.
   c. Cannisters; convex side toward hinges in space provided.
   d. Defogging ointment and wrench in space provided.
   e. Place N6 OBA in box.
      (1) Secure face piece form in face piece.
      (2) Holding mask and T-tube in left hand and body assembly in right, put harness and waist strap in, the N body assembly.
      (3) Place eye covers on.
      (4) Take half turn crossing tubes to place face piece in box.
      (5) Secure in place utilizing hooks and straps available.
   f. Demonstrate the steps above.

SUMMARY

a. Tell and show if possible the four types of OBA.
b. Using the OBA as a guide, name the parts.
c. Review the main differences in the four types.
d. Explain and describe the cannisters used. Show trainee the different cannisters.
e. Go over steps in putting OBA into operation.
f. Demonstrate proper stowage of equipment.
g. Cover safety precautions.

NUMBER F002

TITLE

Flame Safety Lamp and Explosimeter

OBJECTIVE

To acquaint the trainee with the flame safety lamp and explosimeter, their parts and operation, and related safety precautions.

REFERENCES

1. Manufacturer's Instructions for
    a. Flame Safety Lamp
    b. Explosimeter

TRAINING AIDS

1. Flame safety lamp.
2. Explosimeter.
3. Blackboard and chalk.

INTRODUCTION

I love life. Do you? The primary purpose of the MSA explosimeter and the flame safety lamp (Davey lamp) is to detect a gas condition in compartments hazardous to personnel. Understanding their principles of operation and knowing how to use them will help to save your life as well as others.

PRESENTATION

1. MSA Explosimeter is designed to test the atmosphere for explosive vapors.
    a. The gage will register the explosive range but not the type of vapors.
        (1) The sampled air is drawn in and burned on a filament.
        (2) Batteries supply the voltage.
    b. Construction (point out parts to trainees).
        (1) Metal case is moisture and dust proof.
        (2) Control panel consists of rheostat, switch and meter.
            (a) Readings below 60 - safe to work in.
            (b) Readings above 60 - (in the red) unsafe to work in.
            (c) Rheostat knob - (on-off knob).
        (3) Sample hoses, connect to left side.
        (4) Aspirator bulb, connect to right side.
        (5) Filament, platinum wire.
        (6) Six flash light batteries, source of power.

e. Operating instructions (demonstrate while going through steps).
   (1) For testing life end of rheostat knob and turn one quarter clockwise.
      (a) Closes battery circuit.
      (b) Pointer will move up scale, then down below zero.
   (2) Flush meter in fresh air.
      (a) Squeeze bulb five times.
      (b) Two additional for every ten feet of hose.
   (3) Adjust pointer to zero by slight clockwise rotation of knob.
   (4) Place end of hose in area to be sampled.
   (5) Flush five times (two more for each ten feet of hose).
   (6) If indicator moves rapidly to upper percentage range, flush meter and retest to insure accurate reading.
   (7) To secure
      (a) Flush meter and hose.
      (b) Turn knob to "off" permitting bar to drop in slot.

2. The Flame Safety Lamp.
   a. The flame safety lamp is designed to test the atmosphere for oxygen deficiencies in a compartment.
   b. It is also capable of detecting the presence of flammable gases.
      (1) If the presence of flammable gases such as acetelene or hydrogen is suspected, it is considered dangerous, and its use is expressly forbidden
      (2) Most advisable to test compartment first with explosimeter.
   c. Preparing lamp for use (Demonstrate with lamp while going through steps).
      (1) Saturate cotton in font (fuel tank).
         (a) Use naptha only or unleaded white gas if naptha unavailable.
         (b) Wipe spilled fuel from various parts.
      (2) Check and clean air-admission ring gauge and inner and outer gauges mounted above globe.
         (a) These parts constitute safety feature.
         (b) Any slight deterioration is a source of danger.
      (3) Assemble with two asbestos washers in good condition (no cracks).
      (4) Check globe for cracks, chips and cleanliness.
      (5) Place expansion ring inside cage.
      (6) Place shield with expansion ring over gauge and glass.
      (7) Hold font, and screw on shield tight enough to prevent glass from being turned.
      (8) Lock by tightening lock screw with key.

NUMBER F003

TITLE
Fire Pumps

OBJECTIVES
To familiarize the trainee with the P-250, P-500, P-60 and the Hale FZZ.

REFERENCE
1. Operating Instructions Phamplets for each pump.

TRAINING AIDS
1. P-250 - suction hose and strainer.
2. P-500 - suction hose and strainer.
3. P-60 - suction hose and strainer
4. Fuel tanks.
5. Fire hoses and nozzles.

INTRODUCTION
Firefighting aboard ship is a very important evolution. To accomplish this there is provided the fire main to supply water to the hoses and nozzles. In case of failure to the fire main, we have a secondary system. That system consists of the firefighting pumps, some of which are covered in this lesson.

PRESENTATION
1. P-60 (handy billy) pump. (Show trainee parts.)
    a. Driven by an internal combustion engine.
    b. Positive displacement rotary pump.
    c. Connected by flexible coupling.
    d. 2 cylinder, 2 cycle gasoline motor.
2. Ten foot sections of 2" hose - used for suction.
    a. From sea and can be.
    b. Connected to fire plug.
3. S-type suction chamber, used to produce foam.
    a. On suction side of pump.
    b. pickup tube, picks up foam from can.
4. Weight - 160 lbs, can be located near fire.
    a. When fire main ruptures.
    b. When pressure fails.
5. At recommended speed of 3500 RPM.
    a. Delivers 60 gallons per minute.
    b. Pressure of 100 PSI.
    c. Maximum suction lift is 16 feet.
6. Operation: demonstrate.
    a. Connect suction hose and strainer
        (1) To insure tight connections.
        (2) Insure strainer in water.
    b. Connect exhaust hose
        (1) If used inside compartment.

(2) Never elevate over 4 feet (explain).

c. Rig discharge hose and nozzle before starting.
   (1) Nozzle prevents excessive engine speed.
   (2) Causes damage to pump.
d. Fill tank, 1 pint 2190 oil to 1 gallon gas.
   (1) Shake well.
   (2) Open air vent (turn left).
e. Open gas line cock.
   (1) Under engine end of gas tank.
   (2) Open position - handle down.
f. Open carburator needle valve.
   (1) Two full turns from closed position.
   (2) To open - turn clockwise.
g. Move carburetor throttle lever down.
   (1) to C (choke).
   (2) Located on carburetor quadrant.
h. Flood carburetor.
   (1) Hold float pin down.
   (2) Projects through cover of float bowl.
   (3) Let fuel overflow.
i. Start motor.
   (1) Wrap starter cord twice around fly wheel.
   (2) Put foot on rail and pull smartly.
   (3) Repeat as necessary.
j. When motor starts.
   (1) Immediately raise carburetor lever.
   (2) Horizontal position "F".
k. To stop, press stop button.
   (1) Red button on timing lever.
   (2) Hold down until motor stops turning.
l. When experiencing difficulty refer to
   (1) P-60 service manual.
   (2) BUSHIPS, chapter 93, Article 296.

PRESENTATION: Part 2

1. Portable P-500, show trainees parts.
   a. Driven by an internal combustion engine.
   b. Single - suction, single - stage centrifugal pump.
   c. Delivers 500 GPM when operating
      (1) At discharge pressure 100 PSI.
      (2) With a 16 foot suction lift.
   d. Directly connected to engine.
      (1) 4 cylinder, 4 cycle gasoline engine.
      (2) Extended shaft is pump shaft also.
2. Ten foot sections of 4" hose used for suction
   a. Equipped with strainer and foot valve.
   b. Foot valve permits filling of hose for priming, without water running out.

3. Discharge End.
   a. "Y" valve having two 2 1/2" hose connections.
   b. Can be rigged to service six 1 1/2" hoses.
4. Operation: demonstrate.
   a. Connect suction hose, strainer and foot valve.
      (1) Insure tight connections.
      (2) Insure strainer in water.
   b. Connect exhaust hose.
      (1) If used inside compartment.
      (2) To carry fumes to outside.
   c. Rig discharge hoses.
   d. Fill tank; mixture of 1 pink 3065 oil to 1 gallon gasoline
      (1) Tank capacity - 7 1/2 gallons (has two tanks).
      (2) Shake well before mounting.
      (3) Secure by inboard spring hold down clamps.
      (4) Vent is opened automatically when properly secured.
   e. Connect two fuel hoses to bottom of tank.
   f. Open fuel tank valves (wing nuts on each tank).
   g. Turn fuel valve handle toward tank from closed position.
      (1) Check float pin in carburetor bowl.
      (2) Will rise to top when bowl is full of fuel.
   h. Close Y - valves.
      (1) Permits suction pickup.
      (2) Permits pressure buildup.
   i. Prime pump completely.
      (1) Hand primer, pump until hard to operate.
      (2) Bucket primer, through primer opener.
   j. Prime carburetor on engine.
      (1) Plunger on control panel.
      (2) Four strokes.
   k. Start motor.
      (1) Wrap starter cord around pulley.
      (2) Pull cord strongly - do not jerk.
      (3) Pull to full length of cord.
   l. Repeat as necessary.
      (1) Prime carburetor every two pulls.
   m. When engine starts.
      (1) See that pressure gage increases.
      (2) When 75 PSI is reached open valve.
   n. Adjust needle valve until engine runs smooth (13 clicks).
   o. When 75 PSI is reached again open other valve if needed.
   p. Adjust pressure as desired (75 PSI to 100 PSI).
   q. If temperature raises to red area
      (1) Danger, pump is over heating.
      (2) Secure pump, check for reason.
   r. To stop press stop button.
      (1) On control panel.
      (2) Hold until engine stops.

s. When experiencing difficulty refer to
   (1) P-500 service manual.
   (2) BUSHIPS Chapter 93, article 298-301.
t. Have trainee start and stop pump.

PRESENTATION: Part 3

1. Portable P-250; show trainee parts.
   a. Driven by internal combustion engine.
   b. 250 gallon per minute pump - 100 PSI.
   c. pump assembly consists of (point out to trainee)
      (1) Engine.
      (2) Centrifugal pump.
      (3) Water outlet gate.
      (4) Primer pump.
      (5) Pressure regulator.
      (6) Self winding pull starter.
      (7) Six gallon fuel tank.
         (a) Motor controls.
         (b) Pressure regulator and gage.
      (8) Accessories supplied.
         (a) Tri-gate - 2 1/2" to 2 1/2" by 1 1/2" by 1 1/2"
         (b) Extra fuel tank.
         (c) 10' and 20' hard suction hose 3" diameter.
         (d) Foot valve and strain.
         (e) 20' exhaust hose.
      (9) Engine - 2 cylinder, 2 cycle, 25 HP.
      (10) Weight, minus fuel tanks 147 lbs.
   d. Self primed up to 16' may be hand primed through plug top of pump housing.
2. Demonstrate Operation.
   a. Connect suction hose and strainer.
      (1) Insure tight connections.
      (2) Insure strainer in water.
   b. Connect exhaust hose if necessary.
   c. Rig discharge hoses; one 2 1/2" or three 1 1/2" hoses.
   d. Fill tank, mixture of 1/2 pint 3065 oil (30 weight) to 1 gallon 80-100 octane gas.
      (1) Shake well.
   e. Secure fuel tank to frame.
   f. Connect fuel line to plug on control panel.
   g. Pump fuel to carburetor - discontinue pumping when resistance is felt.
   h. Pull choke out.
   i. Open (3/4 turn) high and low speed knobs.
   j. Pull starter rope.
   k. When engine starts, push choke in.
   l. Check pressure gage, should show pressure increase within 20 sec.
   m. Open gate valve slowly.
   n. Adjust high speed dial to best operating position.
   o. To stop press button on control panel hold until engine stops.
   p. Have trainee start and stop pump.

PRESENTATION: Part 4

1. Portable FZZ fire pump.
    a. Driven by internal combustion engine.
    b. Air cooled pump
        (1) Rated to deliver 60 gallons per minute.
        (2) Can deliver up to 80 GPM.
    c. Discharge outlet services one 1 1/2" hose.
    d. Suction hose - two 10' lengths with
        (1) Foot valve and strainer.
        (2) Self primed by holding down cover to exhaust muffler.
        (3) Has suction lift of 10'.
    e. Fuel tank - capacity 2 gallons
        (1) Use gas only.
        (2) Lubrication acquired through oil sump.
            (a) Use 30 weight oil.
            (b) Check before running.
2. Operation: demonstrate.
    a. Connect suction hose strainer and foot valve.
        (1) Insure tight connections.
        (2) Insure strainer and foot valve is in water.
    b. Connect exhaust hose if necessary.
    c. Rig discharge hose, one 1 1/2".
    d. Check fuel and oil.
    e. Open needle valve 1 1/2 turns.
    f. Open choke (lever on intake side of carburetor).
    g. Start engine.
        (1) Wrap starter rope around pulley.
        (2) Pull full length of cord.
    h. Repeat if necessary.
    i. Adjust needle valve to best engine speed.
    j. Prime pump until suction line is full.
    k. To stop, ground out plug with lever.
    l. Have trainees start and stop engine.

SAFETY

1. No smoking.
    a. Mixing fuel.
    b. Refilling fuel tanks.
2. Exhaust hose.
    a. Used in confined places.
    b. Do not raise over four feet.
    c. Water in line will choke out engine.
3. When pulling starter cord, insure area behind is clear of personnel.
4. Get help when moving pumps.
5. Do not use pumps to remove liquid fuel.
6. Know your pump and operate under safe conditions.

SUMMARY

The pumps covered comprise, in part, the secondary firefighting equipment. Knowing them better will aid in the safe guarding of yourself and your ship.

TITLE
Dewatering Equipment

OBJECTIVES
To acquaint the trainee with the dewatering pumps and equipment, their capabilities and operation.

REFERENCES
1. Service Manuals for Pumps.

TRAINING AIDS
1. Damage control method of dewatering flooded compartments, MN-6774.
2. Portable submersible pump.
3. Eductor.
4. Drawing "A", "B", and "C".

INTRODUCTION
In order to retain the stability and freeboard of our ship, the dewatering equipment covered in this lesson is needed. As part of the repair party you should know all the equipment and use. The repair party contains people from all departments.

PRESENTATION
1. Electrical submersible pump (show pump to trainees).
   a. Electrically driven centrifugal pump
      (1) Current rating.
         (a) AC 220-440 volts.
         (b) DC 115-230 volts.
      (2) Horsepower 5-5.7.
      (3) Delivers 180 G.P.M. with 50' static head.
      (4) Construction cast bronze case enclosing three chambers (show drawing "A").
         (a) Water chamber - discharge and cooling.
         (b) Intermediate chamber - lubrication.
         (c) Motor chamber.
      (5) Discharge end - 2 1/2" hose threads.
      (6) Suction end - strainer.
   b. Related equipment (show trainee).
      (1) 75' electrical cable.
      (2) Manual switch box.
      (3) Handling line (married to cable).
      (4) 2 1/2" hose.
      (5) Basket screen (show drawing "B").
   c. Operation.
      (1) Connect discharge hose.

(2) Connect cable to appropriate outlet.
(3) Submerge into water.
(4) Pump will lift 20 feet.
(5) Energize switch.
(6) Have trainee do this.

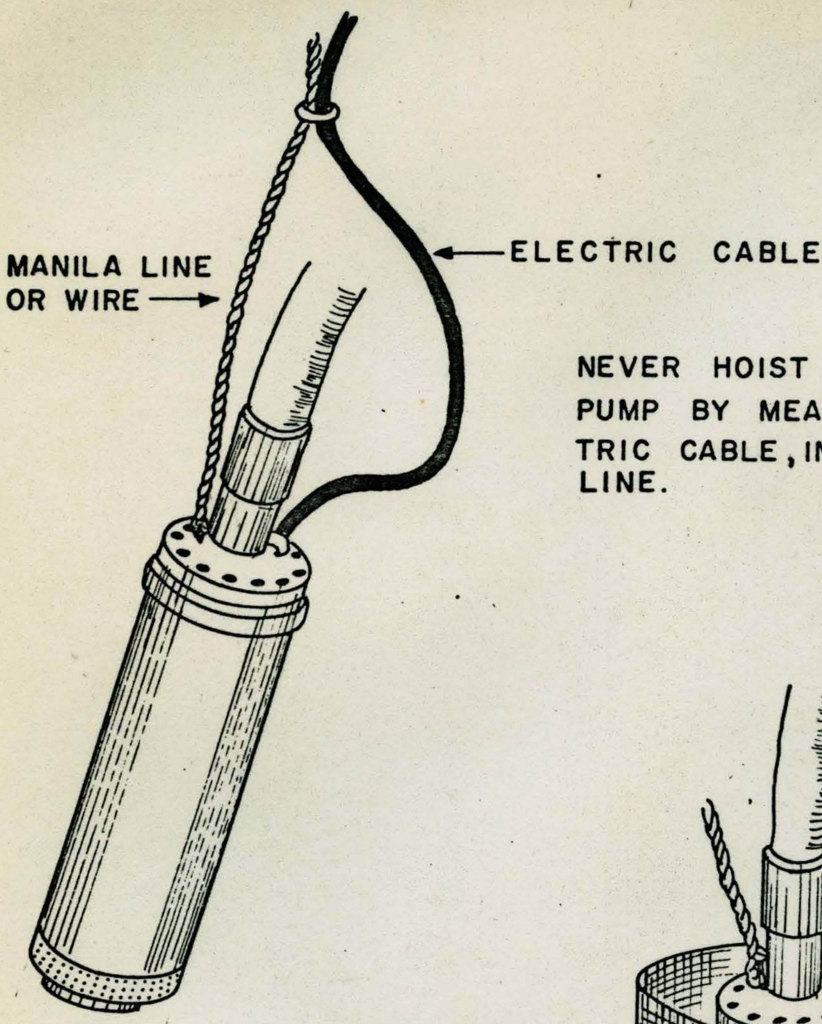
2. Eductors.
   a. Are used to
      (1) Boost lift or motor driven pumps.
      (2) Pump water mixed with and/or fuel.
   b. Two kinds; jet eductor and perijet eductor.
   c. Most serviceable over long periods of time.
   d. Safest pump.
   e. Jet eductor will pass small particles.
   f. Perijet will pass debris up to 3 1/2" in diameter
      (1) If jammed, 4" quick acting valve
         (a) located at discharge end
         (b) forces water back through discharge end
         (c) clearing jammed debris
      (2) Contains six jets in vacuum chamber.
         (a) 7% more efficient than single jet.
   g. Jet eductor; used with p-60, p-500, p-250. Show drawing "C".
      (1) Efficiency of pumps greatly increased.
      (2) Perijet, having no foot valve, cannot be used.
3. T-30 and midland pumps.
   a. Primary purpose is dewatering.
   b. Motor driven centrifugal pump.
   c. Will discharge 300 G.P.M.
   d. Same procedure followed to operate as P-60.
   e. T-30 must be primed.
   f. Midland self primed up to 10'.
4. Safety.
   a. Do not pump flammable liquids with water cooled pumps.
   b. Have suction hose submerged before starting pumps.
   c. Do not operate pumps in confined areas.
   d. (Sub pump) handle by manila line - not power line.

SUMMARY

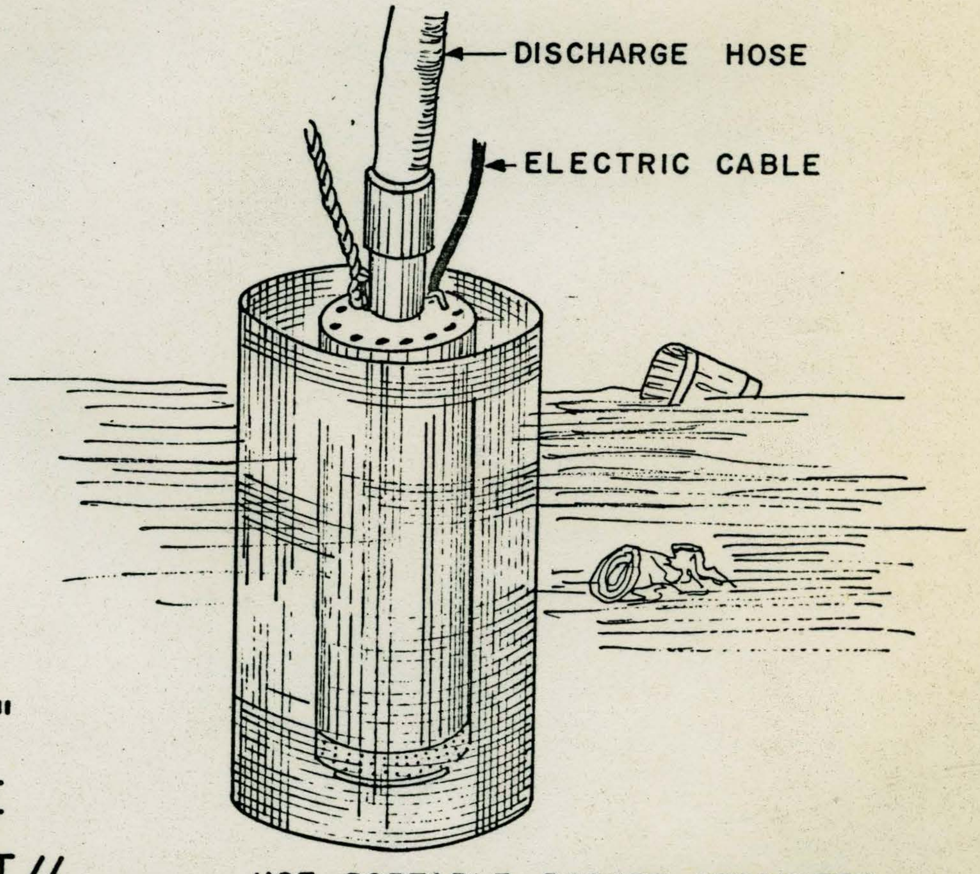
The pumps and equipment covered can be (and some times are) part of the secondary drainage systems. They are emergency equipment and the operation of them should be known by all hands.

SUBMERSIBLE PUMPS

NUMBER F005



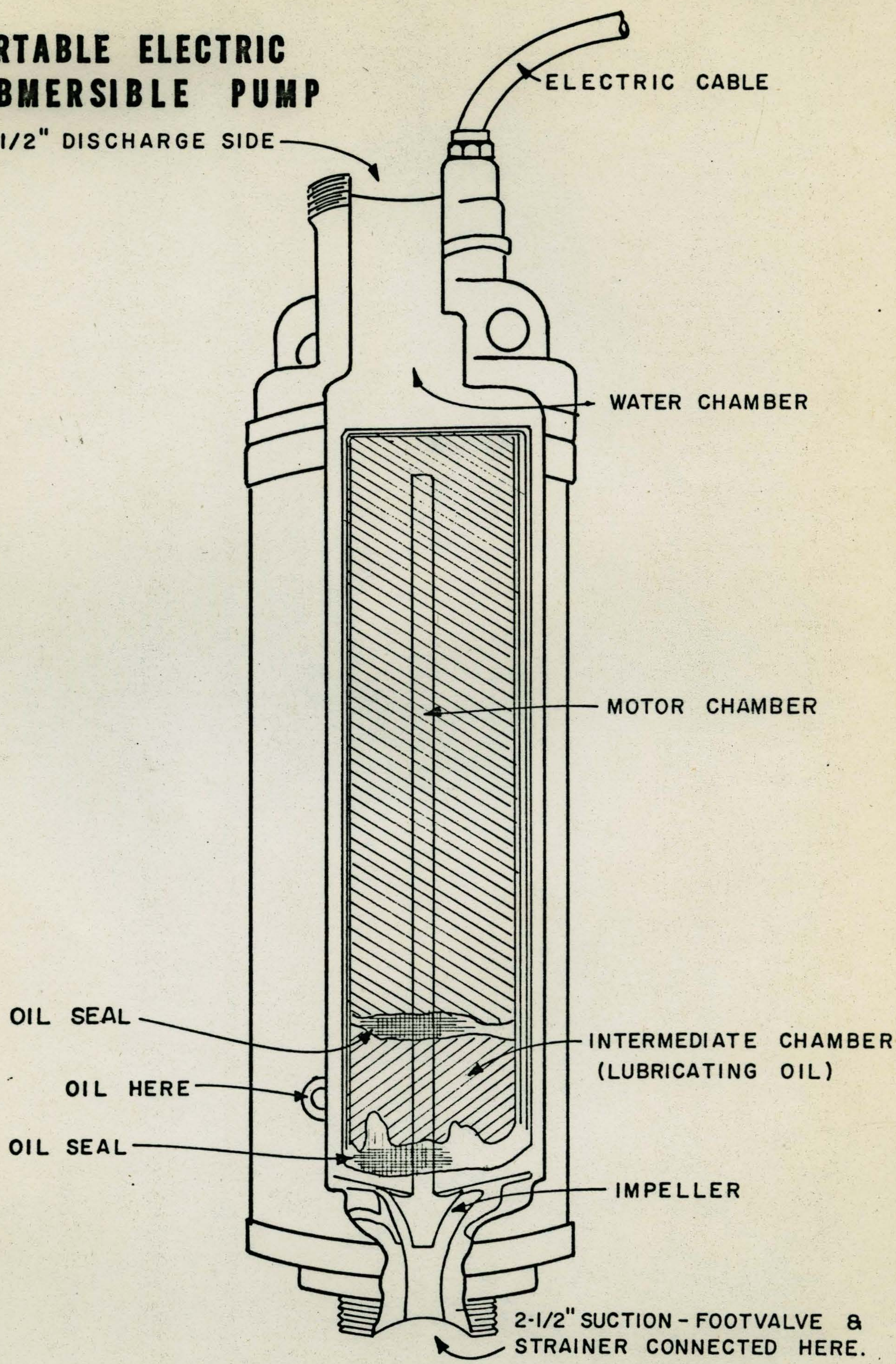
NEVER HOIST OR LOWER THE PUMP BY MEANS OF THE ELECTRIC CABLE, INSTALL A HANDLING LINE.

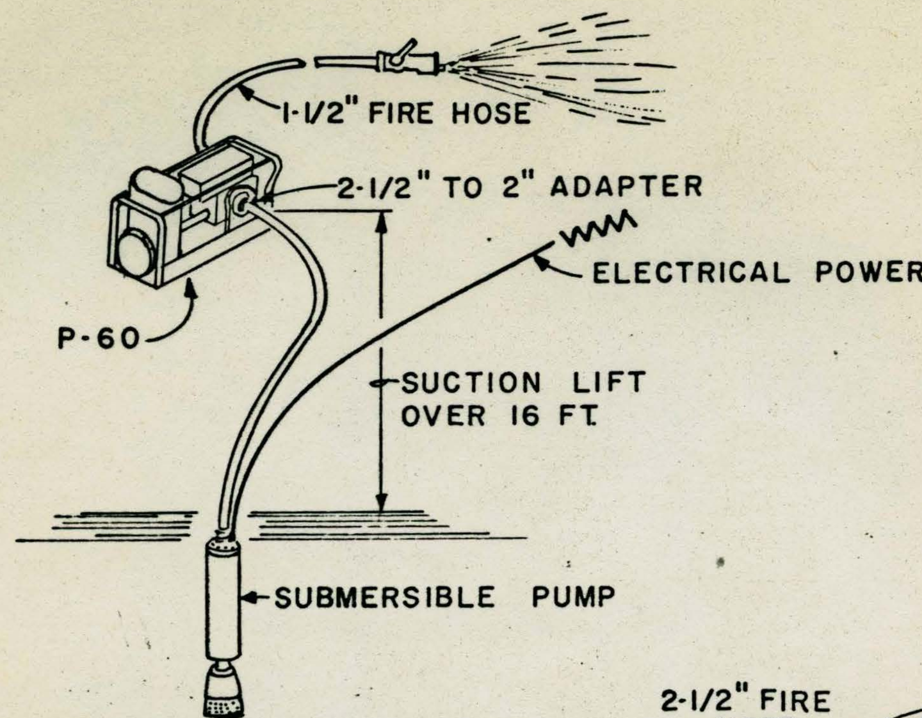


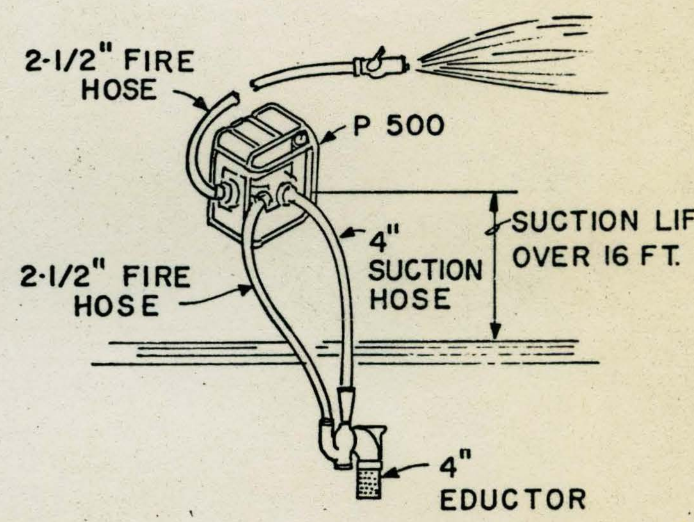
"KINKS" REDUCE OUTPUT!!

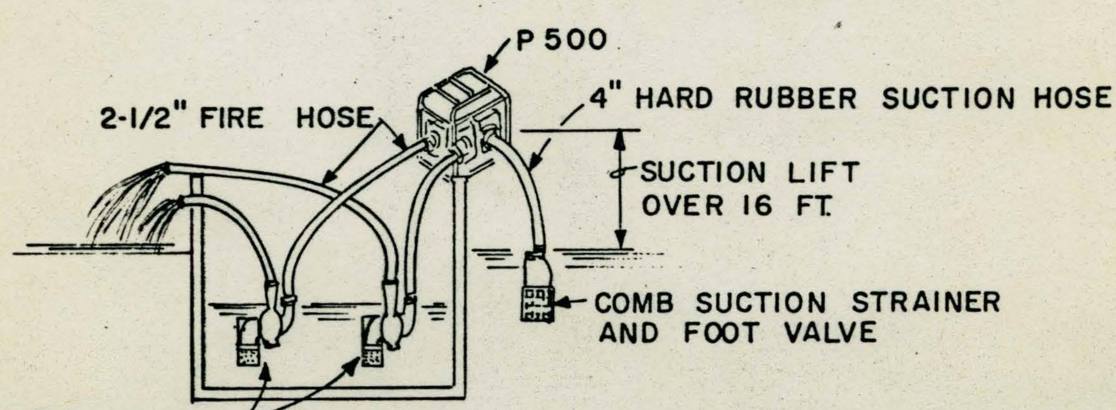
USE PORTABLE BASKET STRAINERS WITH SUBMERSIBLE PUMPS.

PORTABLE ELECTRIC SUBMERSIBLE PUMP




1-1/2" FIRE HOSE
2-1/2" TO 2" ADAPTER
ELECTRICAL POWER
P-60
SUCTION LIFT
OVER 16 FT.
SUBMERSIBLE PUMP


2-1/2" FIRE
HOSE
P 500
SUCTION LIFT
OVER 16 FT.
4"
SUCTION
HOSE
2-1/2" FIRE
HOSE
4"
EDUCTOR


P 500
2-1/2" FIRE HOSE
4" HARD RUBBER SUCTION HOSE
SUCTION LIFT
OVER 16 FT.
COMB SUCTION STRAINER
AND FOOT VALVE
4" EDUCTORS

from the bow (broad on the beam) the distance to the object equals the distance the ship travelled.

(2) Plotted with only the true bearing when the object was abeam and the computed distance.

(6) Estimated position - plotted as a dot and square around it and labeled with time and "EP".

(a) Used when additional data applied based upon estimated data.

(b) Estimating current and applying it to a running fix results in an "EP" which is believed to be more accurate than the running fix itself.

3. Danger bearings.
   a. Needed when proceeding in shoal waters outside of marked and dredged channels or when channel markings are widely separated and/or current effect is strong.
   b. Drawn from charted object to cross course line and lying tangent to the outer most danger point.
   c. As long as bearings are outside danger bearing, ship is safe. If bearings are inside, then the ship may be in a dangerous position.
   d. Demonstrate a danger bearing on local chart.
4. Danger angles.
   a. Horizontal or vertical.
   b. Most accurately obtained with sextant.
   c. For horizontal danger angles, draw circle intersecting danger point closest to course line and two charted objects.
   d. The angle formed by the lines drawn from the danger point to each of the two objects is the danger angle.
   e. All angles inside the circle are larger than the danger angle.
   f. All angles outside the circle are smaller than the danger angle.
   g. If danger point is inside circle, safe angles are less than the danger angle.
   h. If danger point is outside circle, safe angles are greater than danger angles.
   i. Demonstrate both danger angles on a local chart.
   j. For vertical danger angles, use the top and bottom of a tall vertical object of known height. The charted position of the objects is the center of this circle in this case but the angles are used in the same way.
5. Soundings.
   a. Taken continuously in pilot waters.
   b. Added margin of safety.
   c. Check on accuracy of fixes.
   d. Irregular or rough bottom is most useful.
   e. Obtained with fathometer and/or lead line.
   f. Leadline necessary in low visibility or where charts are inaccurate or old. Fathometer is aft and grounding can occur before sounding indicates danger.

TITLE
Collision Procedures

OBJECTIVES
To familiarize the trainee with the recommended procedures to follow should a collision occur. To acquaint the trainees with the proper sequence of reports.

REFERENCE
1. Ship's Organization and Regulations Book, CG-260 series.

TRAINING AIDS
1. Investigation of Damage - MN 49 20D (movie).
2. Hand out "Damage Control Plotting Chart".

INTRODUCTION
The damage resulting from collision can put a ship out of commission. By initiating certain procedures quickly, the damage can be temporarily repaired and the ship returned to port.

PRESENTATION
1. The duties of key personnel
    a. Repair leader, scene leader, etc, are covered in detail in the fire fighting procedure lesson.
    b. Their duties will be basically the same in collision procedures.
    c. The fire fighter will be D.C. repairman. He must know the following:
        (1) Patching and plugging.
        (2) Shoring.
        (3) Access tools.
        (4) Dewatering pumps.
        (5) Main and secondary draining systems.
2. Collision procedures.
    a. Initial action (set condition Z).
        (1) After report of collision.
            (a) Investigate.
            (b) Two man teams.
            (c) Equipment.
                1. Lights.
                2. Gloves.
                3. Sounding tape and wrench.
        (2) Two elements of initial action.
            (a) Report of flooding, and damage as soon as possible
                1. Location: compartment, side and frame or bulkhead number.
                2. Height of water and/or damage in relation to a specific deck, in inches or feet.

3. All hands responsible for passing word, initially and accurately.

(b) On scene action by discoverer.

1. Attempt to check flooding.
2. Use anything available.
3. Isolate compartment if necessary and possible to do so. Secure closures in area.

3. Action.
    a. On scene action directed by scene leader.
        (1) Repairman repair damage.
        (2) Report positive location.
        (3) Report progress of action.
        (4) Request needed equipment.
        (5) Damage report.
    b. Repair party action under direction of repair leader.
        (1) Sends for equipment needed.
            (a) Cutting torch.
            (b) Access gear.
            (c) Plugs and wedges.
            (d) Shoring and tools.
        (2) Send investigators to check boundaries. (look for strain and/or flooding)
        (3) Make prompt and correct reports.
        (4) Have power secured.
        (5) Have dewatering pumps activated.
4. Post action.
    a. Report; hole or split plugged or patched.
    b. Plug or shoring watch set (equipped with hammers).
    c. Pump flooding water out.
    d. Send damage report.
5. Sequence of reports (pass out handouts and explain).
    a. Size and location of split or hole.
        (1) Frame side and compartment number.
    b. Amount of water in relation to deck.
    c. Initial damage report.
    d. Hole or split plugged-plug watch set.
    e. How much seepage, if any.
    f. Pumping started (regular reports of water level).
    g. Plug holding.
    h. Final damage report.
6. Safety.
    1. All hands should be in battle dress.
    2. De-energize electrical circuits prior to entering flooded compartment.
    3. Work under as safe a condition as possible.

SUMMARY

It is imperative that all repair party personnel know basic collision procedures, sequence of reports, and be familiar with the equipment needed to make repairs including safety of personnel.

TITLE
Shoring

OBJECTIVE
To acquaint the trainees with the reason for shoring, equipment needed for shoring and to tell them when and how to shore.

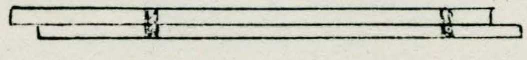
REFERENCE
1. Instruction Material as available in Unit's library.

TRAINING AIDS
1. Blackboard and Chalk.
2. Shoring.
3. Sketches "A", "B" and "C".
4. Shoring equipment.

INTRODUCTION
Shoring is the process of placing supports against a structure to prevent eventual rupture. Ships have been known to sink and they have been known to return to port because shoring was done.

PRESENTATION
1. Equipment used in shoring.
   a. Shore - portable beam.
   b. Shole - Plate under shore to distribute pressure.
   c. Strong back - beam of wood on metal.
      (1) Often shorter than shore.
      (2) Used to distribute pressure or
      (3) Serve as anchor for patch over hole.
   d. Additional equipment.
      (1) Shoring battens.
      (2) Hammer.
      (3) Framing square.
      (4) Saws.
      (5) Clamps.
      (6) Hatchet.
2. Material used for shores.
   a. Douglas fir and yellow pine.
      (1) Best wood available.
      (2) Straight grained and free of knots and cracks.
      (3) Treated with fire resisting chemical.
   b. Hemlock and spruce.
      (1) Not as strong, less satisfactory.
      (2) If used, shore must be heavier for same comparable weight.

3. Sizes of shores.
   a. The length of a shore in use should never be over thirty times its minimum thickness.
      (1) 4" x 4" - 10'
      (2) 6" x 6" - 15'
      (3) 4" x 6" - 10'
   b. Avoids shore bulking or breaking.
   c. The shorter the shore in relation to its thickness, the greater the weight it will support.
   d. When stowing shores.
      (1) Accessible compartments above water line.
      (2) 16 - 18 foot lengths.
         (a) Cut when needed to desired length.
         (b) For minmum waste.
4. Shoring procedures for.
   a. Weakened bulkheads. (Show drawing, sketch "A")
      (1) Vector of supporting force - "K"
      (2) Strong back "S" distributes pressure full length of bulkhead.
      (3) But ends of shore in positions "A" and "B" are secured against overhead and deck beams.
   b. Weakened decks. (Show drawing, sketch "B")
      (1) Strong back "K" on deck and "F" across deck beams.
      (2) Shores "S" and wedges "W" absorb pressure.
      (3) Blocks "N" hold wedges in place.
      (4) Block "P" holds "K" from slipping sideways.
   c. Water tight hatches or doors. (Show drawing, sketch "C")
      (1) Strong backs "S" and "K" form frame work around handwheel and distribute pressure across hatch.
      (2) Strong backs "Q" are laid across "S".
      (3) One or more shores "A" and wedges "W" are used to apply pressure from beam "B".
5. Measuring shores.
   a. Measuring shores can be accomplished by using folding rules, steel tapes or a wooden batten.
   b. A measuring batten can be constructed by
      (1) Securing two 1 1/2" to 1 1/2" x 8' pieces of lumber.
      (2) Using two sliding clamps. (Draw sketch on blackboard)



      (3) Secure each lamp to one batten only.
      (4) Clamps are locked in place when space has been measured.
      (5) Cuts shores 1/2" shorter than space to be filled.

6. When to shore.
   a. There is no strict rule.
   b. Pressure that flooding water creates is not a definite reason.
      (1) More pressure is exerted to deck.
      (2) But there is more strength in decks.
   c. Your own judgement can be the only rule, after inspection.
   d. Look for signs of danger.
      (1) Deep bulges in plating.
      (2) Bowed frames and stanchions.
      (3) Loose rivets.
      (4) Cracks in seams.
      (5) Panting of bulkheads.
   e. Safety.
      (1) Consider the danger signs carefully.
      (2) Work always under safest conditions possible.
      (3) Know how to use tools and equipment for shoring.

SUMMARY

A good shoring job will get your ship back to port. Study the most likely compartments subjected to danger. Have a plan in mind in case. It is better riding on a ship than on a raft.

TITLE
Plugging and Patching.

OBJECTIVE
To acquaint the trainees with the different methods of plugging and patching, tools used, and the necessity of prompt action.

REFERENCES
1. Instruction Material as Available in Unit's Library.

TRAINING AIDS
1. Blackboard and chalk.
2. Plugs and wedges (different sizes).
3. Sheets of rubber and canvas.
4. Oakum.
5. Tools (hammers, wrenches, etc).
6. Soft patching kit.
7. Jubilee patching kit.

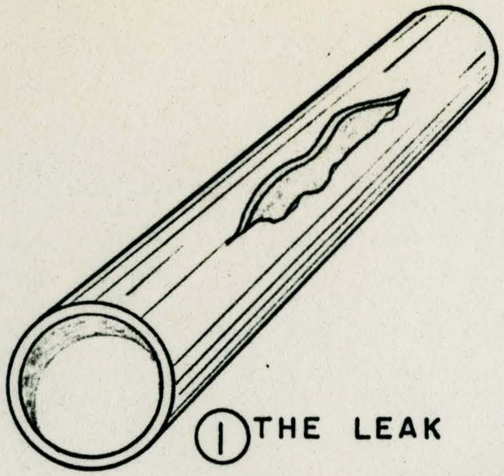
INTRODUCTION
Many ships were sunk in the last war. Few of them sunk as a direct result of the initial damage. Most went down due to collapsing bulkheads and progressive flooding. Prompt action in plugging and patching would have saved a large number.

PRESENTATION
1. Plugs, wedges and oakum.
   a. Wedges, soft wood (Douglas fir or yellow pine).
      (1) Length - six times thickness of butt end.
      (2) Width - from 1 3/4" to 6".
      (3) Must not be painted.
   b. Plugs - soft wood.
      (1) Conical shape.
      (2) Sizes from 1" to 2" diameter.
   c. Oakum.
      (1) Chemical treated cornsilk.
      (2) Expands rapidly when wet.
   d. Combinations of the three are effective on:
      (1) Small holes and splits.
      (2) Cracked plates or seams.
      (3) Warped hatches and leaky stuffing tubes.
      (4) Show sketch "A".

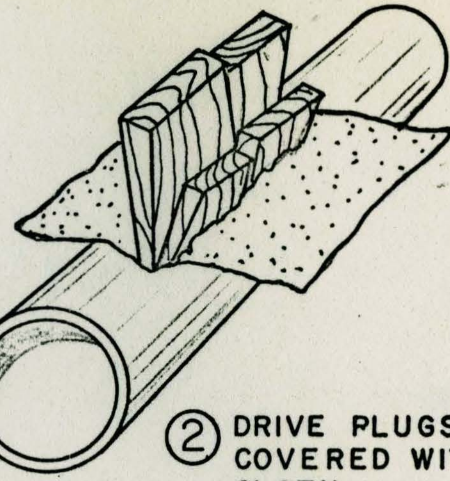
2. Soft patches - low pressure pipe (150 psi).
   a. Materials.
      (1) Wedges.
      (2) Sheet rubber.
      (3) Sheet metal.
      (4) Marlin or wire.
   b. Application.
      (1) Reduce split area - drive in wedge.
         (a) Do not drive in too far.
         (b) Restricts flow of liquids.
         (c) Trim flush with outside of pipe.
      (2) Cover with rubber and sheet metal.
         (a) Extend rubber 2" beyond ends of split and 3/4" distance around.
         (b) Cut sheet metal slightly smaller.
      (3) Secure in place with
         (a) Marlin or wire.
         (b) Served tight around pipe.
         (c) Show sketch "B".
3. Jubilee pipe patch.
   a. Materials.
      (1) Sheetmetal.
         (a) Rolled to cylindrical shape.
         (b) End bent to form flanges.
         (c) Flanges are reinforced and with holes to take 3 to 5 bolts and nuts.
      (2) Sheet rubber packing.
      (3) Wedges if necessary.
   b. Application.
      (1) Insert wedge (same as above).
      (2) Wrap rubber packing.
         (a) Cut to overlap split.
      (3) Apply metal.
      (4) Secure with bolts and nuts.
      (5) Show sketch "C".
4. Damage to ships can result in receiving many various shapes and sizes of holes or splits.
   a. Methods used to repair the damage are just as varying. Show pictures BSTM, Chap 88.
      (1) Mattress - Figure 88-115 - BSTM Chapter 88.
      (2) Conical plug made of blanket - Figure 88-116.
      (3) Prefab leak stopper - Figure 88-117 - 88-118.
5. Safety - Know how to operate tools needed and always work under safe conditions.

SUMMARY

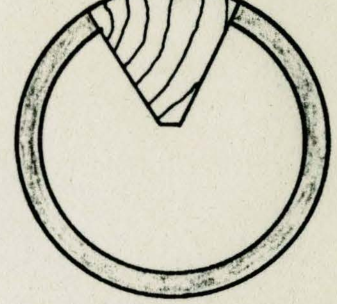
The moral is "hold what you have". Do everything to prevent progressive flooding. Isolate compartments with large and numerous holes that are flooded. Smaller holes, through interior bulkheads, that could cause progressive flooding must be plugged. Use best adaptable method.



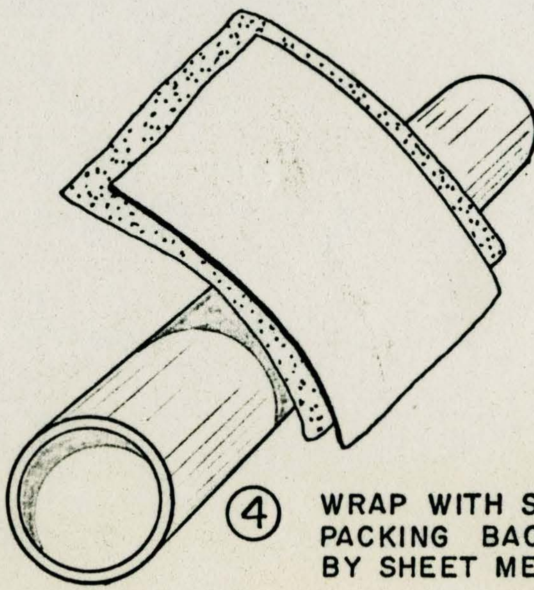
① THE LEAK



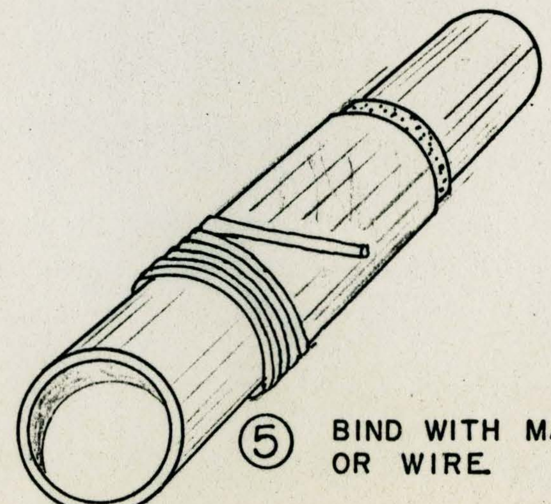
② DRIVE PLUGS COVERED WITH CLOTH



③ CUT OFF PLUGS FLUSH WITH PIPE



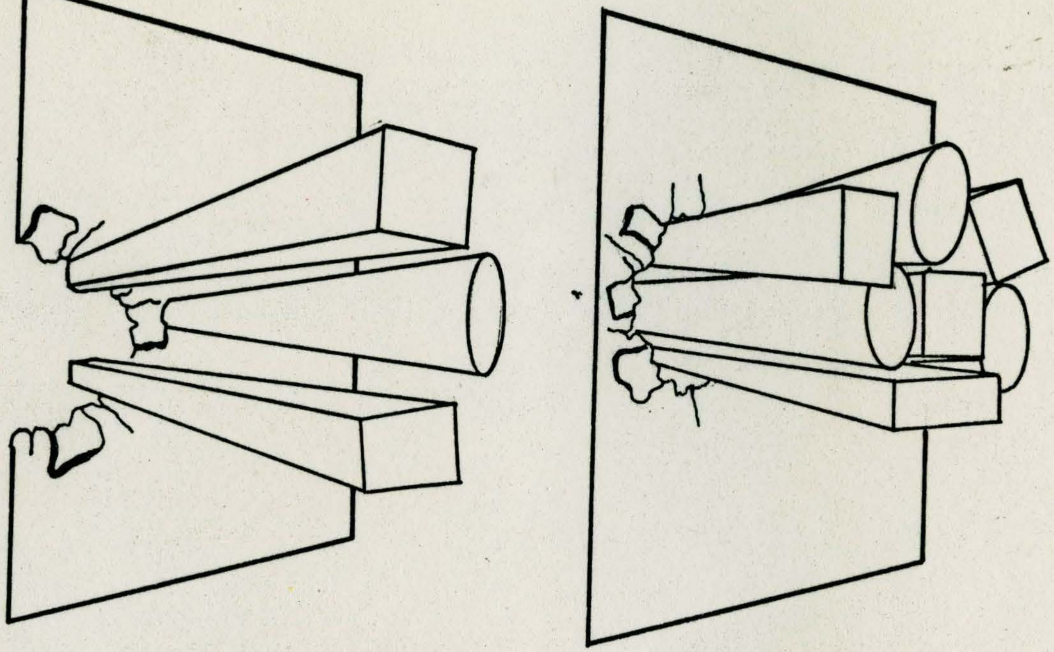
④ WRAP WITH SHEET PACKING BACKED BY SHEET METAL.



⑤ BIND WITH MARLIN OR WIRE.

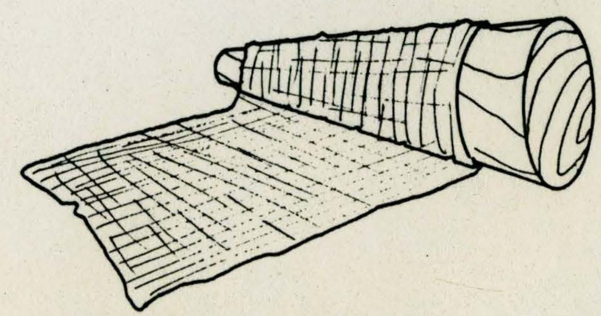
NUMBER F008

SOFT PATCH LOW PRESSURE LINE



COMBINATION PLUGS, CONICAL AND SQUARE ENDS

(FOR JAGGED LEAKS)

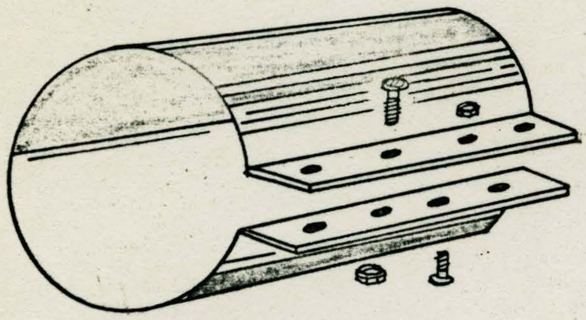


WRAP PLUG WITH CLOTH BEFORE INSERTING.

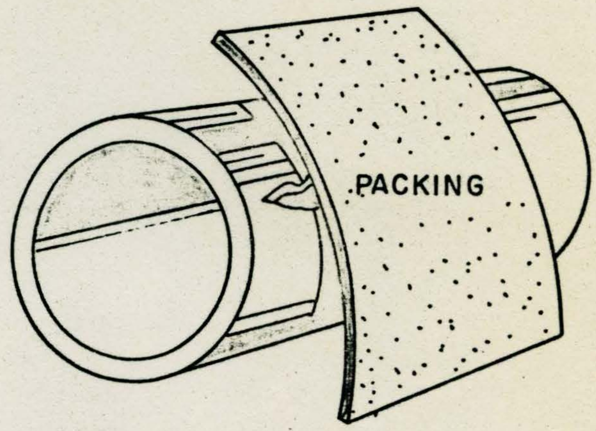
NUMBER F008

JUBILEE PIPE PATCH

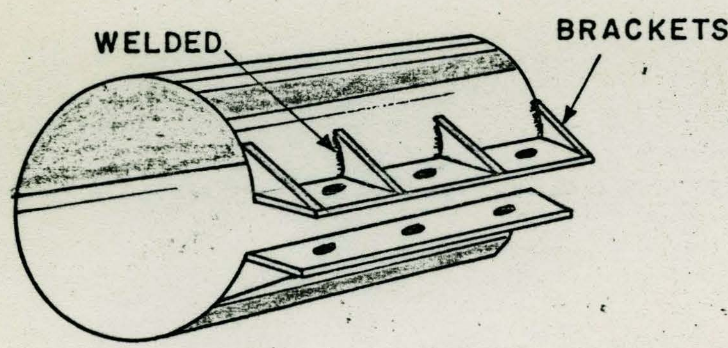
NUMBER F008



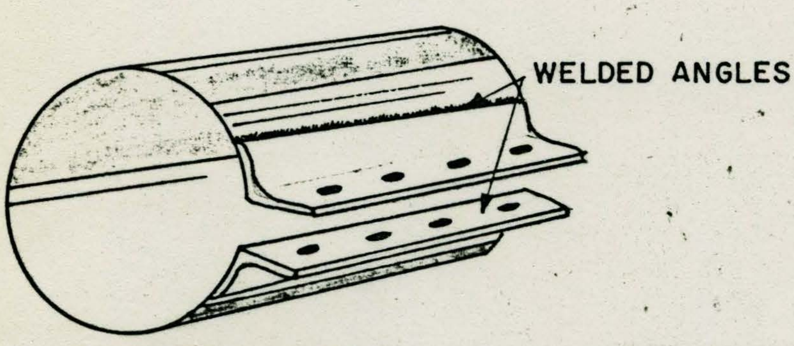
STRAP IRON FLANGE



STEEL METAL COLLAR
SECURED OVER PACKING
WITH NUTS & BOLTS,



STRAP IRON FLANGE



WELDED ANGLE

THREE TYPES OF CLAMPS

TITLE
Compartmentation

OBJECTIVE
To acquaint trainees with how a ship is divided into sections, how compartments, decks and fittings are numbered and the difference in numbering systems before and after March 1949.

REFERENCE
1. Damage Control, by Thomas B. Kelly.

TRAINING AIDS
1. Blackboard and chalk.
2. CG Form 004.
3. Diagram of old and new numbering system.

INTRODUCTION.
In this lesson you will learn the difference between the old and new number systems. Having this knowledge will aid in rapid location of compartments and fittings to meet damage control requirements.

PRESENTATION
1. All ships can be said to be a large box that is subdivided into many small boxes.
    a. This enables the isolation of any damage to a small section of the ship.
    b. Draw suitable diagram on blackboard.
2. Old numbering system.
    a. The ship is divided vertically into three sections.
        (1) "A" section, forward, from bow to forward most watertight bulkhead of engineering space.
        (2) "B" section, midships, from forward watertight bulkhead of engineering space to after watertight bulkhead of engineering space.
        (3) "C" section, aft, from after water tight bulkhead of engineering space to stern.
    b. The ship is also divided horizontally forming decks.
        (1) Upper most completed deck is the 1st deck or main deck.
        (2) Decks above are designated, 01, 02, etc.
        (3) Decks below are designated 2nd, 3rd, 4th, etc. Interbottom deck is 9th deck.
        (4) Platform and partial decks are numbered in relation to where they exist.

c. Compartments are numbered "01" to "99" in each division, using odd numbers starboard, even numbers port. When compartments extend through one or more decks such as water and fuel tanks, they have one number.
   (1) Example - A-1-W, B-2-E, C-1-V (write numbers on blackboard and explain).
d. The last letter designates use of compartment.
   (1) Letter designations.
      (a) - Stowage
      (b) - Battery
      (c) - Communications
      (e) - Engineering
      (f) - Fuel
      (g) - Gasoline
      (l) - Living
      (m) - Magazine
      (t) - Trunks
      (v) - Voids
      (w) - water
e. Numbering of hatches, valves, fittings, etc. (Write fitting number on blackboard and explain). 3-24-2.
   (1) "3" - 3rd deck.
   (2) "24" - Located at 24th frame.
   (3) "2" - Located on port side.

3. New numbering system uses decks, forward frame number and a number to designate port or starboard side. ("0" if center line runs through compartment.)
   a. Example, 3-75-4-M - (Place on blackboard and explain).
      (1) "3" - Compartment on third deck.
      (2) "75" - Forward boundary at frame 75.
      (3) "4" - Second compartment outboard of center line on port side.
      (4) "M" - Ammunition space.
   b. For a compartment that runs through more than one deck, the existing deck level of the compartment is the first part of the number.
   c. Letter designation for compartments use are same as before but with these exceptions:
      (1) Double letter designations.
         (a) AA - Cargo for other ships use.
         (b) FF - Fuel for other ships use.
         (c) GG - Gasoline for other ships use.
      (2) K - Stowage of chemicals and dangerous materials.
      (3) Q - Compartment not covered by other letters. (Spaces not normally manned after working hours.)
      (4) E - Manned engineering spaces only.
      (5) B - No longer used.
      (6) Gas - changed to letter "G". Lub - included under meaning of letter "F".

<u>SUMMARY</u>

Show diagram or drawing on blackboard of old number system. Point out three sections, point out deck numbering. Explain parts of a compartment number and fitting number. Show diagram or drawing on blackboard of new numbering system. Explain parts of a compartment number. Repeat difference in old and new systems.

TITLE

Material Conditions of Readiness

OBJECTIVES

To acquaint the trainee with the proper damage control markings, the different material conditions of readiness and to inform them of when certain fittings are closed.

REFERENCE

1. General Specifications Book, For Particular Ships

TRAINING AIDS

1. Material Conditions Chart NAVSHIPS 250-538-1.
2. CGHQ Form 004.
3. Compartment Check Off List.
4. Blackboard and chalk.
5. Use page two of Lesson Plan as Handout to Trainee if possible.

INTRODUCTION

1. To maintain watertight integrity and to keep your ship afloat, there are certain closures that must be closed.
2. In this lesson you will learn what each marking, on fittings and closures, represent.
3. Knowledge of what markings should be closed or open, under certain conditions, is very important.

PRESENTATION

1. The ships in the Coast Guard are put into three conditions to provide protection from all degrees of danger. (Show material condition chart.)
   a. Condition "X Ray" is set ("X" closed) when there is no apparent danger of attack.
      (1) When ship is at anchor.
      (2) Tied up at home port.
   b. Condition "Yoke" is set: ("X" and "Y" closed) for peace time cruising.
   c. Condition "Zebra" is set ("X", "Y" and "Z" closed) in war zones, heavy weather and at GQ.
   d. "W" and Z fittings are closed when there is danger of or during NBC attack.

USE AS HANDOUT TO TRAINEE IF POSSIBLE.

2. Classification of fittings.
   a. X Types of XRAY FITTINGS.
      (1) Compressed air valves.
      (2) Drainage valves.
      (3) Air test fittings.
      (4) DC voids not containing pressure piping.
      (5) Closures not required for routine work.
   b. Y Types of YOKE FITTINGS.
      (1) All glass air ports.
      (2) Access to shops and utility spaces.
      (3) Generator and pump rooms.
      (4) Small manned spaces below the water line.
      (5) Vent ducts to paint and flammable liquid storerooms.
   c. Z Types of ZEBRA FITTINGS.
      (1) Airtight and watertight that are not YOKE.
      (2) Deck drain valves.
      (3) Scuppers for plumbing drains and plumbing vent valves.
      (4) Segregation of fire main and fire main to flushing valves.
      (5) Ventilation to quarters, offices, shops.
      (6) Replenishment air to vital spaces.
   d. (X) (Y) Types of (X) AND (Y) FITTINGS
      (1) Alternative access on damage control deck and above.
      (2) Scuttles in shaft alleys and small manned spaces below water line.
      (3) Access to battle stations, ammunition transfer or for the operation of vital stations.
      All (X) and (Y) fittings may be opened without special permission but should be closed when not in use.
   e. [Z] Types of DOG Z FITTINGS. [Z]
      (1) All access to weather not equipped with blackout switches.
      (2) Excluding pilot house doors.
      (3) All metal battle port covers, must be closed on condition Z.
   f. W Types of W FITTINGS.
      (1) DC voids containing pressure piping and fire main valves.
      (2) Ventilation and recirculatory systems for vital spaces.
      (3) Shall be closed to prevent the spread of damage or to make emergency repairs.
   g. (W) Types of (W) FITTINGS.
      (1) All pilot house doors and ventilation fo machinery spaces.
      (2) Shall be closed for gastight envelope.
   h. (Z) Types of (Z) FITTINGS.
      (1) Limited access to messing and sanitary spaces.
      (2) Certain fans and closures to quarters and sanitary spaces.
      (3) Must have special permission to open.

3. Closure log is maintained, in keeping with the effective danger control conditions.
   a. Log is kept by the officer of the deck or DC central while underway.
   b. Information recorded will be:
      (1) Fitting number and classification.
      (2) date and time opened and closed.
      (3) Person's name and rate.
4. Compartment check off lists.
   a. Regulations require that a compartment check off list shall be posted in every compartment or on every weather deck area where any damage control facility is located.
   b. Purpose.
      (1) They provide an itemized list indicating the location of all classified damage control fittings, as well as other facilities used for damage control purposes.
   c. The compartment check off list is also used as a ready reference and as a guide for personnel responsible for setting certain material conditions of readiness. Item included on compartment check off lists: (Show compartment check off list to trainees)
      (1) Watertight access fittings and airports.
      (2) Closure and controllers in the vent system.
      (3) Valves in the fuel system.
      (4) All riser and cut-out valves of the fire main system.
      (5) Valves in the magazine sprinkler system.
      (6) Cut-out valves for either hull piping systems.
      (7) Air test fittings.
      (8) Sounding tube outlets.
      (9) Air escapes or vents having closure devices.
      (10) Root cut-out valves for ships service steam and fresh water lines.
      (11) Caps for overboard discharge connections for portable pumps.
   d. Check off list also include:
      (1) Sound powered telephones.
      (2) Casualty power cable outlets and risers.
      (3) Battle and ships service telephones.
   e. Check off lists also indicate:
      (1) The classification of the fittings.
      (2) The division responsible for setting and maintaining the fitting in the state of closure required by the material condition of readiness in effect.
      (3) All departments are usually asked to meet the responsibility for setting XRAY and YOKE fittings, and the repair party is usually assigned the responsibility for setting ZEBRA fittings.

<u>SUMMARY</u>

Review material conditions (Show chart NAVSHIPS 250 - 538 - 1) and what fittings are closed during these conditions. Review classification of fittings. Tell why a closure log is kept and the information contained. Review compartment check off list. Show trainee list.

NUMBER F011

TITLE

Damage Control Equipment (D.C. Kit)

OBJECTIVES

To acquaint trainees with the tools and equipment found in the damage control kit and to explain their uses.

REFERENCE

Unit's Damage Control Allowance List.

TRAINING AIDS

1. Actual DC Kit and tools.
2. Blackboard.

INTRODUCTION

The equipment in the damage control kit is for emergency use only. All members of the repair party must know what it contains and how to use it to the best advantage.

PRESENTATION

1. The D.C. kit. Used to provide tools needed to make emergency repairs.
    - a. Kept locked to prevent use, other than for emergency purposes.
    - b. Box painted red, stenciled - "D.C. Repair Kit" - in white.
2. Tools and equipment (show each item).
    - a. Bolt cutters - 2': to cut bolts and locks.
        - (1) Cuts up to 1/2" stock.
        - (2) Will not cut tempered metal.
    - b. Wrecking bar 30": to pry open doors and move heavy objects
        - (1) Claws to remove spikes.
            - (a) Used same manner as hammer.
    - c. Axe - forcible entry tool.
        - (1) Weight balanced equally on both legs.
        - (2) Swing in a safe arc.
        - (3) Make sure area clear of personnel.
    - d. Sledge and hammers - used to pound wedges into place.
    - e. Hand saw - metal cutting - to cut through metal (stantions and cable).
    - f. Lights head and hand; to see in darkened compartments
        - (1) Batteries are not in flashlights.
            - (a) Must be inserted when put to use.
    - g. Screwdrivers: tighten and loosen screws.
    - h. Pliers: for holding small objects.
    - i. Chisel: (Cold) cut bolts and nuts.
    - j. Rubber gloves: handle electrical equipment.
    - k. Oakum, 5 pounds: used to pack around wedges and plugs.
    - l. Soft patch equipment
        - (a) Sheet lead
        - (b) Canvas
        - (c) White lead - #5 can

(d) Marlin - treated line.

m. Friction tape: taping electrical wiring.

n. Steel wedge: pry apart seams and joints.

3. Safety.
   a. Keep fingers out of way of hammers.
   b. Use extreme care when using axes.
   c. Hold chisels loosely.
   d. Watch out for flying bolt heads and nuts.
   e. Protect your eyes.
   f. Use the proper tool for the job.

SUMMARY

Knowing how to use these tools properly will help you correct damage which occurs. Remember, these tools and equipment are for emergency use only. Do not put them in your pocket and forget to return them.

NUMBER F012

TITLE

Emergency Cutting Outfit

OBJECTIVE

To acquaint the trainees with the "Portable Oxyacetylene Cutting Apparatus", its operation and purpose.

REFERENCE

1. Instruction Material as available in Unit's Library.

TRAINING AIDS

1. Portable oxyacetylene cutting apparatus.
2. Related equipment.
3. Piece of metal plate or pipe and clamp.

INTRODUCTION

The emergency cutting outfit is a necessary part of fire fighting equipment. Anyone can learn to operate it and everyone in the repair party should be familiar with it.

PRESENTATION

1. Portable oxyacetylene cutting apparatus - types.
   a. Pack type cutting outfit.
   b. Portable oxyacetylene welding and cutting outfit.
   c. Except for the fact that the latter can be used for welding also, there is no essential difference.
2. Uses.
   a. Cut away debris in the way of:
      (1) Fire fighters.
      (2) Repair parties.
   b. Cut holes to insert applicators or hose nozzles in
      (1) Bulkheads.
      (2) Decks.
3. Parts and related equipment (show trainee).
   a. Metal stowage case.
   b. Canvas carrying case (with harness).
   c. Two oxygen cylinders (with valves).
   d. One acetylene cylinder and valve.
   e. Oxygen regulator and manifold.
      (1) Pre-set at factory.
      (2) How it works.

f. Acetylene regulator.
    (1) Pre-set at factory.
    (2) How it works.
g. Acetylene hose (red, left hand threads).
h. Oxygen hose (black or green, right hand threads).
i. Torch and #2 cutting tip.
j. Tool bag.
    (1) Goggles, gloves, igniter, wrench, test gage, spare tip.
k. Spare cylinders (2 oxygen, 1 acetylene).

4. Operating procedures. (Demonstrate to trainee).
    a. Inspect equipment.
        (1) Insure that all connections are tight.
        (2) Insure that area is clear of burnable materials.
    b. Starting.
        (1) Open oxygen valves to manifold
            (a) Open one at a time.
            (b) Open slowly and completely.
        (2) Open acetylene valve.
            (a) 1/4 turn (repeat - 1/4 turn).
            (b) Safety feature, explain.
        (3) Open pre-heating acetylene valve.
            (a) 1/4 turn.
            (b) Light torch with igniter.
            (c) Do not let unburned acetylene escape in confined place.
        (4) Open pre-heating oxygen valve.
            (a) 1/4 turn.
            (b) Adjust to neutral flame (clear, blue white, with sharp edges).
    c. Making cut (demonstrate).
        (1) Start at edge of metal.
        (2) Pre-heat metal.
            (a) To cherry red.
            (b) Keep ends of cone 1/16" above metal.
        (3) Press oxygen cutting lever.
            (a) All the way down, slowly.
        (4) Move torch in direction of cut.
            (a) Keep tip at right angle to surface.
            (b) Moving too fast loses cut.
            (c) Moving too slow fuses cut.
            (d) Do not submerge tip into molten metal.

(5) To make inside cut.
 (a) Pre-heat metal.
 (b) Press cutting lever slowly, at same time raising or tilting to deflect molten spray.
 (c) Lower torch when cut is through metal and follow line of cut.
 (d) Let trainee make practice cut (straight and inside cut) after demonstrating.

d. Securing apparatus (have trainees do this).
 (1) Close a pre-heating acetylene valve.
 (2) Close pre-heating oxygen valve.
 (3) Close oxygen and acetylene cylinder valves.
 (4) Open pre-heating valves to drain hose.
 (5) Test cylinders. If oxygen reads 500 pounds or under, replace all cylinders.

e. Capabilities.
 (1) Cuts up to 1" metal.
 (2) Last 25 minutes of continuous cutting time.

f. Safety precautions.
 (1) Wear goggles and gloves while cutting.
 (2) Do not let grease or oil come in contact with any part of apparatus.
 (3) Do not attempt repairs on any part of the apparatus.
 (4) Direct torch away from persons when igniting.
 (5) Check area for burnable materials, in back of heated spot also.

SUMMARY

The portable oxyacetylene cutting apparatus is an emergency piece of equipment used as an aid to fighting and over hauling a fire. It is important that you remember its capabilities and how to start and secure it.

INSTRUCTOR: Repeat demonstration of lighting and securing without repeating the comments.

NUMBER F013

TITLE

Atomic Theory I (Basic)

OBJECTIVE

To acquaint trainees with the basic theory of an atom so that they may better understand nuclear warfare.

REFERENCE

1. Instruction Material as available in Unit's library.

TRAINING AIDS

1. Blackboard.
2. Picture of an atom.

INTRODUCTION

In order to have a good basic understanding of atomic defense it is necessary that a good general knowledge of nuclear physics is required by all Coast Guard personnel.

PRESENTATION

1. Basic parts of an atom: (Draw a picture of an atom on blackboard with names of parts alongside items).
   - a. Proton. (Point out on blackboard)
     - (1) Electrical charge positive.
     - (2) Located in the nucleus of an atom.
     - (3) The number of protons in the nucleus determines the elements' name and atomic number.
   - b. Neutron. (Point out on blackboard)
     - (1) Electrical charge none.
     - (2) Located in the nucleus of an atom.
     - (3) Exerts nuclear forces (binding) on other nucleons.
     - (4) Protons, neutron ratio determines if atom is radioactive.
   - c. Electron. (Point out on blackboard)
     - (1) Electrical charge is negative.
     - (2) Located rotating around the nucleus, in shells or orbits.
     - (3) They exist in the outer structure of atoms not in the nucleus, and are largely responsible for inter atomic and molecular forces. They determine the valence of atoms.
2. Basic structure.
   - a. Atom - the smallest part of an element that will still retain all the properties of that element.
   - b. Element - a substance, or kind of matter, which cannot be decomposed by ordinary chemical means.
   - c. Molecules - the smallest particle that can exist in the free state and still retain the characteristics of a substance.
   - d. Compound - a substance made up of two or more elements.

3. Elements.
   a. There are 92 elements found in nature, above element #92, i.e., 94, 95, etc., are man made elements.
   b. There are 103 known elements to date; 11 are man made.
   c. All substances found in nature are composed of these elements.
4. Stable and unstable atoms.
   a. Neutron, proton ratio.
      (1) The neutron, proton ratio determines if the atom is radioactive.
      (2) If there are too many protons in the nucleus of an atom, a proton will change identify, becoming a neutron with the emission of a Beta particle with a positive charge. B+ (positron).
      (3) If there are too many neutrons in the nuclei, a neutron will change identify to a proton, with the emission of a Beta particle with a negative charge. B-
      (4) Both of these transitions are spontaneous reactions, where unstable atoms strive to acquire a stable state.
      (5) Another form of acquiring stability is by ejecting Alpha particles which consist of two protons and two neutrons.
      (6) With both forms of acquiring stability, a Gamma ray sometimes is released.
5. Isotopes.
   a. Isotopes are atoms which have the same number of protons in their nuclei, but a different number of neutrons in the nuclei and which have identical chemical properties of the basic atom.
6. Fission of heavy nuclei.
   a. Fission is the process whereby a neutron is fired at the proper velocity into a heavy nuclei, causing it to split into at least two smaller nuclei with a great release of energy.
   b. The fission fragments are usually radioactive but have a short half life.
   c. As the fissioning process continues, a chain reaction by new neutrons from the fissioning process causes more fissioning, until most of the material is exhausted.
   d. The great amount of energy released is in the form of:
      (1) Blast, in the air.
      (2) Shock, in the ground or water.
      (3) Thermal radiation.
      (4) Nuclear radiation.

7. Fussion of the lighter nuclei.
   a. Fussion is the process of fusing several light nuclei to form a heavy, more tightly bound nucleus.
   b. A great amount of energy is released during the process in the form of blast, shock, thermal and nuclear radiation.
   c. The sum of the individual parts weigh more than the whole, this loss of weight is given off as energy.

SUMMARY

1. Review introduction.
2. Proton, located in the nucleus of an atom.
   a. The number of protons determines the element's name and atomic number.
3. The neutron is located in the nucleus of an atom.
   a. Exerts nucleus forces (binding) on other nucleons.
4. Electrons are located in the nucleus of an atom. Rotate around the nucleus in shells or orbits.
5. Review item number 2 (basic structure).
6. Atomic Theory II will cover radiation, half life, half thickness shielding, symptoms and effects of nuclear radiation.

TITLE

Atomic Theory II (Basic)

OBJECTIVE

To continue Atomic Theory so that trainees will better understand nuclear warfare.

REFERENCE

1. Instruction Material as available in Unit's Library.

TRAINING AIDS

1. Blackboard.
2. Pictures of an atom.

INTRODUCTION

In order to have a good basic understanding of atomic defense, it is necessary to have a general knowledge of nuclear physics.

PRESENTATION

1. Nuclear radiation.
   a. Alpha particle.
      (1) Contains two protons and two neutrons, it is referred to as the nucleus of the helium atom.
      (2) Carries a positive charge.
      (3) Can be stopped by sheets of paper.
      (4) The rate of travel is 1/10 the speed of light.
      (5) The distance of travel from the omitter is 1 to 3 inches in air.
      (6) The most hazardous type of radiation if taken internally.
      (7) Alpha particles come from unfissioned bomb material.
      (8) Alpha emission is found to occur in atoms whose atomic number is greater than 82.
   b. Beta particle.
      (1) The Beta particle comes from the nucleus of atoms and is referred to as a high speed electron.
      (2) It carries a negative charge.
      (3) Can be stopped by 1/8" sheet metal.
      (4) The rate of travel is 9/10 the speed of light.
      (5) The distance of travel is 10 to 30 feet in the air.
      (6) It is considered an internal and external hazard.
      (7) Beta particles come from fissioned bomb material and induced radioactive substances.
   c. Neutrons.
      (1) Carry no electrical charge.
      (2) The rate of travel is 1/20 the speed of light for fast neutrons.
      (3) The distance of travel is approximately 1,000 yards in air.

(4) Neutrons are released during the fission process.
(5) Neutrons cause ionization indirectly.
(6) They have the ability to induce radioactivity into non-radioactive elements.
(7) Damp earth and concrete are considered good shielding from neutrons.

d. Gamma rays.
(1) Contain no mass or charge.
(2) Are referred to as electro magnetic waves at high frequency.
(3) Gamma rays cannot be stopped completely.
(4) Travel at the speed of light.
(5) Have low ionizing power.
(6) Are considered an internal and external hazard.
(7) Materials that will reduce the intensity of Gamma rays one half, or 50%, are called half thickness materials.
(a) Half thickness shielding materials:

1.	Lead	3/4 inches
2.	Steel	1 1/2 inch
3.	Concrete	6 inches
4.	Earth	7 1/2 inches
5.	Water	13 inches
6.	Fuel oil	14 inches
7.	Wood	23 inches
8.	Air	20 feet

2. Half life.
a. The time it takes for a radioactive element to decay to the next lowest form. (Intensity is reduced by 1/2.) Example: Radium half life is 1590 years; at the end of 1590 years, half of the radium disintegrates to Radon and at the end of 3180 years, 3/4 of the original Radium has disintegrated to Radon.
b. Each radioactive element has its own half-life:
Example: Lutecium - 73 billion years (73,000,000,000)
Polonium - 3 ten million ths of a second (3/10,000,000)
c. The other elements that are radioactive have half life expectancies in between these two.

3. Ionization.
a. Ionization is the process of producing charged particles (positive or negative) in air or living tissue.
b. The ionization of an atom would result in the development of an ion pair, i.e., two parts, one positive and one negative.
c. Ionization is accomplished by the knocking or pulling out of electrons from their orbit or shells.

d. The following will cause ionization.
   (1) Alpha particles.
   (2) Beta particles.
   (3) Gamma rays.
   (4) XRays.
   (5) Neutrons.

4. The damage to the body from nuclear radiation depends on two types of dosages.
   a. A great amount of radiation received within a 24 hour period, over the entire body is considered to be an acute dose.
   b. Small amounts of exposure over an extended period of time is considered to be a chronic dose.

5. Effects of various doses of nuclear radiation over varying periods of time:

DOSE	1 DAY	3 DAYS	1 WEEK	1 MONTH	3 MONTHS
200 R	50% sick	25% sick	15% sick	2% sick	0% sick
	100% sick	60% sick			
300 R	20% die	5% die	40% sick	15% sick	0% sick
	100% sick	100% sick	90% sick		
400 R	50% die	25% die	15% die	50% sick	5% sick
	100% sick	100% sick	100% sick	80% sick	
600 R	95% die	90% die	40% die	10% die	10% sick

6. Symptoms of radiation sickness:
   a. First symptom is nausea and vomiting.
   b. With doses of 450 to 600 R nausea and vomiting will occur in from one to two hours.
   c. Other symptoms are:
      (1) Inflammation of mouth and throat.
      (2) Loss of hair.
      (3) Loss of appetite and general malaise (digestive tract damage).
      (4) Diarrhea and nose bleed.
   d. Recovery is dependent on previous health of victim.

SUMMARY

1. Review the presentation.
2. Alpha particles the most hazardous type if taken internally.
   a. Can be stopped by a sheet of paper.
   b. Alpha is found in unfissioned bomb material.
3. Beta particles can be stopped by 1/8 inch sheet metal.
   a. Travels 10 to 30 feet in the air.
   b. Considered an internal and external hazard.
4. Neutrons travel 1,000 yards in the air and only from the fission process. Neutron radiation unlikely hazard due to it traveling 1,000 yards from explosion.

5. Gamma rays cannot be completely stopped.
   a. Travel the speed of light.
   b. Are an internal and external hazard.
   c. Review the half thickness shielding materials.
6. Stress that 150 roentgens produce radioactive symptoms.
   a. 450 roentgens cause 50% of the people present to due.
   b. 600 roentgens cause 98% of the people present to die.
7. Review symptoms of radiation.

NUMBER F015

TITLE
Nuclear Explosions and Effects

OBJECTIVE
To familiarize trainees with types of nuclear explosions and their effects.

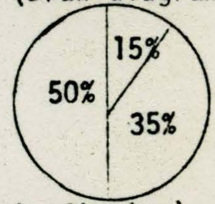
REFERENCE
1. Instruction Material as available in Unit's library.

TRAINING AIDS
1. Film, MA 1887, The Atom Strikes.
2. Blackboard.
3. Pictures of types of explosions (effects of Nuclear Weapons Manual).

INTRODUCTION

On 6 August 1945 the first atomic bomb was dropped on Hiroshima. The population of the city was 300,000 of which 250,000 people were in the four square mile area in the center of the city; the bomb was exploded over the center of the city at 1850 feet. As a result of the explosion, approximately 70,000 people were killed and another 70,000 people were injured. Three days later, on 9 August, the second atomic bomb was dropped over Nagasaki, this city had a population of 250,000 people As a result of this explosion, 36,000 were killed and 40,000 were injured.

PRESENTATION
1. Types of burst.
   a. Air.
      (1) Air burst is any burst where the fire ball does not touch the surface.
   b. Surface.
      (1) Surface burst is any burst that touches the surface.
   c. Sub-surface (underwater).
      (1) Sub-surface burst is any burst when the fire ball is not visible from the surface.
2. Air burst.
   a. Distribution of energy in a typical air burst. (Draw diagram on blackboard).
      (1) Blast and shock 50%.
      (2) Thermal radiation or heat 35%.
      (3) Nuclear radiation 15%.



   b. Nuclear radiation.
      (1) Prompt or initial radiation 5%.
          (omitted during fissioning process - explain fission)
          (a) Types of radiation.
              1. Gamma rays.
              2. Neutron.

(2) Delayed or residual radiation 10% (fallout radiation). (emitted during the decay of the fission products).
   (a) Types of radiation.
      1. Alpha.
      2. Beta.
      3. Gamma.

c. Blast effects.
   (1) At the point of blast a pressure or blast wave is formed by the sudden expansion of gases heated to extreme temperatures, traveling out at supersonic speeds.
   (2) As the blast wave projects outward, an over pressure is produced, i.e., a pressure over the normal pressure at sea level, 14.7 or 15 psi. the pressure developed is dependent on many things.
      (a) Yield of weapon (yield means explosive size).
      (b) Weather conditions.
      (c) Altitude of detonation.
      (d) Terrain.
      (e) Mach effect, and etc.
   (3) Development of Mach stem.
      (a) As the blast wave projects out in a spherical shape, it reflects off the surface. The reflected waves will join the primary wave and reinforce it. The point where the reflected wave joins the primary wave is called the Mach stem. This Mach stem increases the pressure two to three times the original pressure.

3. Surface burst.
   a. Area of damage:
      (1) Will be of less magnitude than that of a similar weapon that is detonated in air (area wise).
      (2) The reason for this is because more of the bomb's energy goes into ground shock and into vaporizing materials at the earth's surface.
      (3) This accounts for an over destruction at ground zero and an under destruction with increase of range from around zero.
   b. Blast effects.
      (1) Blast in air is similar to air burst but tends to Produce over destruction near ground zero. May also produce heavy ground shock near crater.
   c. Crater.
      (1) Moderate to extensive crater is developed.
      (2) It varies with the magnitude and height of burst.
   d. Initial nuclear radiation.
      (1) Similar to air burst, Gamme and Neutrons.
      (2) Of longer duration due to low altitude of fire ball.

e. Nuclear residual radiation.
  (1) Will be much more than in an air burst.
  (2) There will be more FALL OUT associated with a surface blast because of more material being vaporized.

f. Base surge. (Explain base surge)
  (1) May develop.
  (2) Depends on topography, terrain, prevailing atmospheric conditions, etc.

4. Underwater burst.

a. Blast effects.
  (1) Water shock wave will be of great magnitude.
  (2) Blast wave in air is of less magnitude than in AIR or SURFACE bursts.
  (3) Shock wave on a ship will appear in two general types.
    (a) First, there will be the direct effects of shock on vessel's hull.
    (b) Second, there will be the indirect effects of shock due to components within the ship being set in motion by the primary shock.
  (4) Damage incurred by SHOCK WAVE.
    (a) Hull of ship will tend to distort below the waterline.
    (b) Rupture of the shell plating, thus producing leaks as severly stressing the ship's framing.
  (5) Thermal radiation.
    (a) Largely absorbed by surrounding water.
    (b) Fire ball will not be visible because of its rapid cooling.
  (6) Initial nuclear radiation:
    Largely absorbed by surrouding water.

b. Base surge.
  (1) There will be a substantial base surge.
  (2) Will deliver the residual radiation.

c. Nuclear residual radiation.
  (1) Will be considerable.
  (2) Will contaminate nearby land and sea areas.

d. Water plume and wave. (Explain and draw picture of a water plume.)
  (1) When a nuclear bomb explodes underwater, the bubble of hot gases will burst through the surface developing a hollow chimney "plume" of water and spray to be shot upward.
  (2) The plume is hollow permitting the hot gases to vent.
  (3) Millions of gallons of water are shot upward; when the water descends, it produces waves and the development of the base surge.
  (4) The waves are no real significance because of the rapid decay. However, they will do damage to close land areas.

SUMMARY

1. The three tynes of bursts are air, surface and sub-surface.
2. In an air burst remember that radiation is not the most destructive force.
3. In an air burst, shock waves are the most destructive force and constitute 50% of the yield of the bomb. Radiation consists of 15% of the yield.
4. In a surface burst, the main destructive force is also shock. An over destruction at ground zero is produced in the form of a large crater.
5. Sub-surface burst (underwater) produces shock waves of a great magnitude. Damage incurred by shock waves will cause distortion below the water line. There will be substantial base surge that will deliver the residual radiation.

NUMBER F016

TITLE
Radiation Detection Meters (AN/PDR-18)

OBJECTIVE
To instruct trainees in the equipment used for early detection and identification of nuclear radiation.

REFERENCE
1. Disaster Control (Ashore and Afloat) Manual

TRAINING AIDS
1. Blackboard
2. Disaster Control (Ashore and Afloat) Manual.

INTRODUCTION
Since nuclear radiation cannot be detected by any of the five senses, special instruments and devices have been developed to do this job. From the military standpoint, we not only need to detect radioactivity, but we need to know where the source of the radiation is and what the intensity is. Radiac instruments serve both of these needs. In this lesson we will cover one of these instruments, the AN/PDR-18.

PRESENTATION
1. General description.
    a. High intensity - scintillation counter.
    b. Gamma survey meter only.
    c. Range 0 to 500 roentgens, per hour.
    d. Meter has a range scale color code.
2. Meter range selector. (Show each item)
    a. Located at the right of the handle.
    b. Selector knob has nine positions.
        (1) OFF.
        (2) A-BATT. CHECK.
        (3) B-BATT. CHECK.
        (4) ZERO.
        (5) CALIBRATE.
            (a) The above words are printed on the dial.
            (b) In the above position, the dial is white.
            (c) Remaining 4 positions are for the range scales of the meter.
3. Zero adjustment knob. (Demonstrate)
    a. To set the instrument on zero prior to use.
    b. Must be 0 prior to calibration.
4. Calibration knob. (Show on meter)
    a. To adjust the sensitivity of the instrument.
    b. Sensitive element is exposed to a source in the instrument.

5. Power Supply.
   a. Dry cell batteries.
   b. Limited battery life, requires zero adjustment and sensitivity check.
6. Chassis design. (Show each item)
   a. Water tight.
   b. Portable.
   c. Lugs on instrument for shoulder strap attachment.
   d. Push button on the handle for dial illumination.
7. Placing instrument into operation. (Demonstrate with meter)
   a. Turn range selector knob to "A" position.
      (1) Should be on or to the right of the "A" marker.
      (2) Indicates proper function of filament supply.
   b. Turn selector knob to "B" position.
      (1) Should read on or to the right of the "B" marker.
      (2) Indicates ample power supply.
   c. Turn selector knob to zero position.
      (1) Adjust needle to "0".
      (2) Must check zero frequently, especially in the field.
   d. Turn selector knob to "CAL" position.
      (1) Adjust needle to calibrate full scale deflection.
8. For detection and measurement.
   a. Attach harness.
   b. Adjust instrument for waist level check.
      (1) All readings should be taken from waist level.
      (2) Maintaining same distance will provide a true survey picture.
   c. Turn range selector knob to necessary range.
      (1) Always start at highest range scale and work down.
   d. To illuminate dial, press button on the handle.
   e. To secure.
      (1) Be sure instrument is in the off position.
         (a) Spent batteries cause corrosion.
         (b) For prolonged storage, remove batteries.
         (c) Replace instrument in case and return to storage place.
9. Maintenance.
   a. Always get proper authorization first.
   b. Refer to instrument book, Radiac Set AN/PDR-18, NAVSHIPS 91715 - Section 5.

SUMMARY

The AN/PDR-18 is portable and is capable of detecting and measuring high intensitites of gamma radiation from 0 to 500 roentgens per hour.
It will detect gamma radiation only. It is used to assist in command decisions, to maneuver, to close fittings and ventilation systems, to secure circulation systems, to calculate stay time and to make shipboard surveys.

5. Power Supply.
   a. Dry cell batteries.
   b. Limited battery life, requires zero adjustment and sensitivity check.
6. Chassis design. (Show each item)
   a. Water tight.
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NUMBER F017

TITLE
Radiation Detection Meter (AN/PDR 27)

OBJECTIVE
To instruct trainees in the equipment used for early detection and identification of nuclear radiation.

REFERENCES
1. Disaster Control (Ashore and Afloat) Manual.

TRAINING AIDS
1. Blackboard.
2. Disaster Control (Ashore and Afloat) Manual.

INTRODUCTION
Since nuclear radiation cannot be detected by any of the five senses, special instruments and devices have been developed to do this job. From the military standpoint, we not only need to detect radioactivity, but we need to know where the radiation is and what the intensity is. Radiac instruments serve both of these needs. In this lesson we will cover one of these instruments, the AN/PDR 27.

PRESENTATION
1. General description of the AN/PDR-27.
   a. Meter design.
      (1) Lo-R Geiger Mueller type survey meter.
         (a) Measures gamma from 0 to 500 MR/HR.
         (b) Will detect beta with shield off probe tube.
      (2) Color code and range scale. (Show color code on meter.)
         (a) Yellow 0 to 500 MR/HR (Instrument).
         (b) White 0 to 50 MR/HR (Instrument).
         (c) Green-yellow 0 to 5 MR/HR (Probe tube).
         (d) Light blue 0 to .5 MR/HR (Probe tube).
      (3) Meter range selector. (Show each selection on meter).
         (a) Off position.
         (b) Batt condition.
         (c) 500 MR/HR.
         (d) 50 MR/HR.
         (e) 5 MR/HR.
         (f) .5 MR/HR.
      (4) Headset provided for audible signals. (Show headset.)
         (a) To source of clicks.
         (b) Rapidity of the clicks indicate increase in intensity.
2. Power supply, batteries.

3. Chassis design.
   a. Portable-battery operated.
      (1) Batteries confined beneath the handle casting in a separate chamber.
      (2) Batteries can be removed and replaced without exposing the circuit.
4. Simplicity of reading.
   a. When ranges are changed, numerals and colors change.
   b. Meter read directly in MR/HR.
5. Shoulder strap lugs for carrying.
6. Placing instrument into operation.
   a. Procedures. (Go through each procedure on meter.)
      (1) Turn to batt condition.
         (a) Should read to the right of line marked batt.
         (b) Line is the point below which operating voltage is insufficient.
      (2) Check operation of the circuit, with the test sample.
         (a) On 500 scale meter should read 0.
            1. Place colored end of test sample in the dimple of the chassis.
            2. Meter should read 10 to 30 MR/HR.
         (b) Turn to 50 range scale.
            1. Place colored end of test sample in the dimple.
            2. Dimple should read 5 to 15 MR/HR.
         (c) On 50 and 500 ranges, tube in the chassis is in use.
            1. Detects and measures gamma.
            2. For survey on these ranges instrument is turned toward the source.
         (d) Turn to 5 range. Use probe.
            1. Place colored end of the test sample against the center of the probe.
            2. Meter should read 1 to 3 MR/HR.
         (e) Turn to 0.5 range.
            1. Place clear end of test sample against probe (to prevent overloading the tube).
            2. Meter should read .1 to .3 MR/HR.
7. Prior to use of monitoring.
   a. Put on the harness.
   b. Connect the headset.
   c. Check batt condition.
8. Start at the highest range scale and work down. Stop at range scale when meter shows indication of radiation.
9. For survey carry at waist level.
   a. Maintain meter or its probe at the same distance.
   b. Turn instrument so tube being used is facing the source or highest indication.
10. For beta detection.
   a. Use probe with meter on 5 or .5 MR/HR range.
   b. Leave beta shield in place after reading.
   c. Remove shield, take reading and calculate beta contributions.

11. To illuminate, dial while on one of the ranges, tilt to 45 degrees.
12. Calibration.
    a. Performed at authorized calibration station only. Every six months.
    b. Must be performed in an area free of large metallic objects to avoid inaccuracies.
    c. Instrument should be re-calibrated when error plus or minus ten percent.
13. To secure instrument.
    a. Be sure instrument is off.
    b. Replace in case and secure.
    c. For prolonged storage remove batteries.
14. Maintenance.
    a. Always get proper authorization FIRST.
    b. Refer to instruction book raciac set AN/PDR 27.

SUMMARY

The AN/PDR 27 radiac set is a portable, watertight, battery operated instrument that furnishes visual and aural indication of the detection and/or measurement of gamma and beta radiation. It has a range of 0 to 500 milliroentgens per hour (MR/HR) and is used to detect low intensity beta radiation or low intensities of beta and gamma radiations together, or detect and measure gamma radiations alone. In general, it is used for detailed monitoring of personnel, spaces, and material.

TITLE
Radiation Detection Meter (AN/PDR-43)

OBJECTIVE
To instruct trainees in the equipment used for early detection and identification of nuclear radiation.

REFERENCE
1. Disaster Control (Ashore and Afloat) Manual

TRAINING AIDS
1. Blackboard
2. Disaster Control (Ashore and Afloat) Manual

INTRODUCTION
Since nuclear radiation cannot be detected by any of the five senses, special instruments and devices have been developed to do this job. From the military standpoint, we not only need to detect radiation, but we need to know where the source of radiation is and what the intensity is. Radiac instruments serve both of these needs. In This lesson, we will cover one of these instruments, the AN/PDR-43.

PRESENTATION
1. High range beta gamma survey meter.
    a. Operating principle ionization.
    b. Range from 0 to 500 roentgens per hour.
2. Range scale color code. (Go through scale and show colors.)

Color	Degree of Danger	Range Scale
Red	Mortally dangerous	0 to 500 r/hr
Pink	Extreme danger	0 to 50 r/hr
Orange	Slight danger	0 to 5 r/hr

3. Meter range selector. (Indicate each item on meter.)
    a. Located under carrying handle.
    b. Has five positions. (Show each position.)
        (1) Off.
        (2) Batt.
        (3) 0-500 r/hr.
        (4) 0-5 r/hr
        (5) 0-50 r/hr.
4. Function selector disk.
    a. Located at bottom side of radiac meter. (Show selector disk.)
    b. Positions: (three) (Show each position.)
        (1) Check.
        (2) Gamma.
        (3) Beta.

5. Light switch (indicate).
   located on top of front panel.
6. Cal. screw.
   a. Located on top of front panel.
   b. The operator is not permitted to adjust this control.
   c. Calibration is accomplished by radiac repair facilities at a Naval repair installation.
7. Carrying case components. (indicate each item)
   a. Instruction book.
   b. Carrying harness (plastic).
   c. Plastic bags - covers instrument to prevent contamination.
8. Power supply.
   a. Two 1 1/2 volt cells.
9. Sequence of operation.
   a. Pre-operational check. (Go through each step on meter.)
      (1) Move function selector disk to the check position. (This places a beta test sample, located internally, in front of mica window forward of the "GM" dector tube.)
      (2) Turn selector switch to "Batt" position. The pointer should be to the right of battery line, if not, replace all batteries.
      (3) With the selector switch on the "500" position, the pointer should deflect.
      (4) With the selector switch on the "50" position, the pointer should read 1.0 r/hr ± 30%.
      (5) With the selector switch on the "5" position, the meter should read 1.0 r/hr ± 30%.
10. Operation check.
    a. Remove the radiac meter from carriers.
    b. Perform pre-operational check.
    c. If desired, to check for beta, move function selector disk where the beta position is facing the arrow. This puts the aluminum (mylar) port under the "GM" mica window. Beta particles will pass through this port to give an indication of beta radiation of all three ranges.
    d. In order to measure gamma radiation, the function selector disk must be in the gamma position facing the arrow.
    e. In order to obtain the greatest possible accuracy, the selector switch should be on the range which during use indicates the full scale at least ten percent.
    f. When operation is completed, return the selector switch to the off position.
11. Safety.
    a. Do not attempt to calibrate instrument using sample as a radiation standard. Test sample serves only as an indicator of operation of the equipment.

5. Light switch. (Indicate)
   Located on top of front panel.
6. Cal. screw.
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    d. In order to measure gamma radiation, the function selector disk must be in the gamma position facing the arrow.
    e. In order to obtain the greatest possible accuracy, the selector switch should be on the range which during use indicates at least ten percent of full scale.
    f. When operation is completed, return the selector switch to the off position.
11. Safety.
    a. Do not attempt to calibrate instrument using sample as a radiation standard.
    b. Test sample serves only as an indicator of operation of the equipment.

b. Aluminum foil (mylar) port on function selector disk.
   (1) Do not allow anything to touch the port.
   (2) It is very thin and delicate, is broken and punctured easily.

c. All repairs will be done at a Naval repair facility.

d. Caution - contains radioactive source.

SUMMARY

The AN/PDR-43 is a high intensity survey meter. It is used to measure gamma radiation from 0 to 500 roentgens per hour and to detect beta radiation. It provides three sensitivity ranges: 0 to 5 roentgens perhour, 0 to 50 roentgens per hour, and 0 to 500 roentgens per hour. This set consists of a case, carrying strap, and a technical manual, NAVSHIPS 92879.

NUMBER F019

TITLE

Personnel Equipment for Detection of Radiation

OBJECTIVE

To instruct personnel in the use and operation of personnel equipment for detecting radiation.

REFERENCE

1. Disaster Control (Ashore and Afloat) Manual

TRAINING AIDS

1. Blackboard.
2. Pictures from Disaster Control Manual, Chapter 6.

INTRODUCTION

Detection of radiation is an important part of nuclear warfare and instruments as discussed in this lesson are for personnel protection against acute doses. Coast Guard personnel are required to know personnel detectors for their own safety.

PRESENTATION

1. IM-9.
    a. Pocket type.
    b. Self reading (explain).
    c. Measures accumulated dose.
    d. Reads gamma radiation only.
    e. Will indicate 0 to 200 roentgens.
    f. At one end of the IM-9 is the charging contact used when charging from an associated radiac detector charger, (PP-311/PD) and at the other end is an optical eye piece used to read the amount of radiation to which the wearer has been exposed.
2. IM-10T, IM-143.
    a. Are also self-reading pocket radiac meters (or dosimeters).
    b. Are very similar to the IM-9.
    c. Each has a different range.
        (1) IM-9 from 0 to 200 milliroentgens.
        (2) IM-107 from 0 to 200 milliroentgens.
        (3) IM-143 from 0 to 600 milliroentgens.
3. DT-60-PD.
    a. A non-self indicating dosimeter.
    b. Worn by all hands.
    c. Detects gamma radiation (XRay).
    d. Measures up to 600 roentgens.
    e. Dosage type instrument.
    f. Principle of operation - fluorescence of certain materials.
    g. Worn about the neck as dog tag.
    h. Can be read by a CP-95-PD.

4. Reader - computer indicator CP-95-PD.
    a. Computes and indicates the total amount of gamma radiation a DT-60-PD (or wearer) has been exposed to.
    b. Description of instrument.
        (1) Cover assembly.
            (a) Contains accessories.
            (b) Encloses front of panel.
        (2) Front panel.
            (a) Meter has two scales.
            (b) Power switch.
            (c) Range toggle switch.
            (d) Two potentiometer controls.
            (e) Power cable receptacle.
            (f) Spring loaded door and skillet assembly.
    c. Operation of CP-95-PD.
        (1) Connect to 115 volt AC supply.
        (2) Allow equipment to warm up for 5 minutes.
        (3) Place test lever in "CAL A" position.
        (4) Throw meter switch to 200.
        (5) Turn power switch to "on" then continue to "Start". Hold until red indicator glows in meter, then release.
        (6) Adjust "A ADJ" knob for "A" meter reading.
        (7) Place test lever in "CAL STD" position and adjust "CAL ADJ" knob until meter needle coincides with red pointer.
        (8) Repeat adjustments until balance is obtained.
        (9) Insert exposed locket (DT-60-PD) in locket holder. Place lever in "READ" position and read roentgens directly on meter scale.
            (a) Always read on the 200 scale; if reading is above 200, shift toggle switch to the 600 scale.
        (10) Check "CAL A" and "CAL STD" positions before reading to insure accuracy.
            (a) Each time a new DT-60-PD is read, go back and start with step #6.
5. Safety.
    a. Never tamper with equipment.
    b. Keep stowed in a controlled space.
    c. Never trade or lose your personnel detector.
    d. Be sure to give correct indicated reading.

SUMMARY

Most of the pocket dosimeters in use today are designed to measure gamma radiation but by proper design of chamber wall or gas filler material, self-indicating ionization chambers may be used to measure other types of ionizing radiation. Pocket dosimeters are delicate instruments and should be handled with care. If these instruments are dropped, they may be discharged.

TITLE
Protective Clothing and Gas Mask

OBJECTIVE
To make aware to trainees that protective equipment for nuclear, biological and chemical warfare is available and to describe its use and capabilities.

REFERENCES
1. Disaster Control (Ashore and Afloat) Manual.

TRAINING AIDS
1. Suit of impregnated clothing.
2. Mark V gas mark.
3. Blackboard.

INTRODUCTION
Protective equipment and protective clothing have application in nuclear and biological warfare and it is to the advantage of all Coast Guard personnel to be completely familiar with its uses and capabilities.

PRESENTATION
1. Impregnated protective clothing.
    a. Consists of
        (1) Cotton -twill cloth impregnated with a chemical, chlorine and parafin or bee's wax to hold the chemical in the clothing.
        (2) Two pairs of socks.
        (3) Overalls.
        (4) Jumpers.
        (5) Wool gloves or cotton gloves.
        (6) Rubber gloves.
        (7) Rubber foot gear.
2. Use of protective clothing.
    a. Used to neutralize blister agents, vapors and fine spray.
    b. Provides little protection against nerve agents.
    c. Gives limited protection against other types of NBC warfare contamination.
    d. Offers better protection than ordinary clothing for chemical warfare.
3. Limitation of protective clothing.
    a. Large drops or splashes of blister agents will penetrate suit.
    b. Must be stowed in cool, well ventilated place, away from direct sunlight.
    c. Should not come in contact with organic solvents or their vapors. (alcohol, gasoline, TCE, etc)

   d. Prolonged wearing may cause a rash to develop where skin is in contact with clothing. (especially in hot weather)
   e. If worn in rain, it loses some of its effectiveness against blister agents.
4. Testing of impregnate in clothing.
   a. Impregnant is good for about 36 months in storage.
   b. Impregnant should be tested after every washing.
   c. Clothing must be tested every six months. Tropics, every three months.
   d. Use the M1 test kit for testing the clothing.
5. Gas mask.
   a. Types of gas masks.
      (1) Naval diapham Mark I (NDO-MK1).
      (2) ND MK4.
      (3) ND MK5.
6. Nomenclature of gask mask MK V.
   a. Head harness.
      (1) All rubber head harness.
      (2) Top head harness straps; temple strap, cheek straps.
   b. Eye piece.
      (1) Wide vision lens.
   c. Outlet valve.
      (1) Thin rubber disc for an outlet valve.
   d. Speaking diapham.
      (1) For communication, to speak with mask on.
   e. Face piece.
      (1) All rubber.
      (2) MKV has pneumatic seal inside.
          Seal will give good airtight fit for all shapes and sizes of face.
7. Canister holder.
   a. MK V canisters are held on by a rubber apron.
8. Canisters.
   a. Metal body with a mechanical filter of solid particles of activated charcoal.
   b. Purifies air. Does not manufacture oxygen.
   c. Protects completely against blood, choking, vomiting and tear gases. Also against nuclear radiation particles.
   d. Gives limited protection against nerve and blister agents.
   e. The activated charcoal breaks down in about 30 minutes from vapor of blood gases.
   f. Highly resistent to water.
9. Method of donning gas mask.
   a. At command "Gas", stop breathing.
   b. Remove head gear. Yank open carrier case with left hand.
   c. With right hand, remove mask from carrier. Hold bottom of carrier with left hand.

TITLE
Nuclear Attack and Decontamination Procedures.

OBJECTIVE
To instruct trainees in the procedures of decontamination in order that they may better contend with the contamination problem that may exist.

REFERENCE
1. Disaster Control (Ashore and Afloat) Manual.

TRAINING AIDS
1. Blackboard.

INTRODUCTION
The basic purpose of decontamination is to minimize the nuclear contamination through removal so that the mission of the ship can be carried out without endangering the life or health of assigned personnel. This lesson will aid you to achieve this goal.

PRESENTATION
1. Nuclear, biological and chemical warfare defense. The action taken to protect this vessel from the effects of nuclear, biological or chemical warfare agents consists of those damage control measures normally used to combat the effects of other emergencies, supplemented by additional measures to provide for the following:
   a. Attack probable.
      (1) Set material condition YOKE.
      (2) Rig water washdown system, secure the applicators but not the nozzles. Leave valves open so system can be operated remotely.
      (3) Strike below unnecessary absorbent material.
      (4) Pass out DT-60/PD Casualty dosimeters.
      (5) Test the water washdown system for satisfactory operation.
   b. Attack imminent.
      (1) Set material condition ZEBRA.
      (2) Sound general quarters, personnel to man NBC stations.
      (3) Break out protective clothing and gas masks. All personnel don protective clothing utilizing wet weather parkas, overalls,, gloves and boots; overlap clothing from top down, fasten snugly all

NURSER F021

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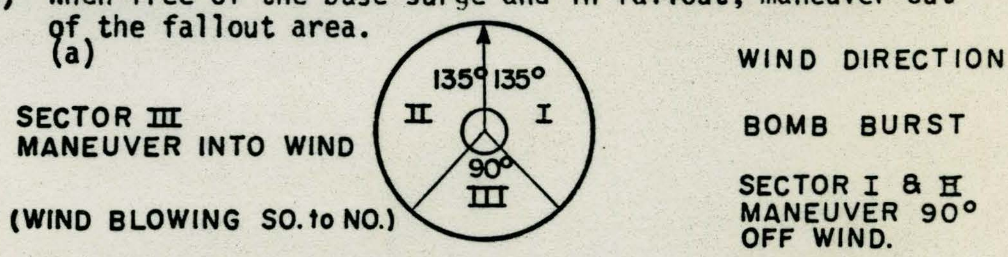
openings at neck, wrists, and ankles after donning, topside personnel wet down clothing externally, repeating as necessary to keep surface of clothing wet, issue to personnel in accordance with the following priorities:
(a) Personnel required to be exposed topside.
(b) Bridge personnel.
(c) Engine room personnel.
(d) All others.
Personnel for whom wet weather clothing is not available will don any type of additional clothing snugly securing all openings at neck, wrists, and ankles.
(4) Close non-classified vents, jury rig as necessary.
(5) Close Circle W fittings.
(6) Reduce exposed personnel to a minimum.
(7) Activate washdown system.
(8) Maneuver vessel away from expected target area, preferably upwind in accordance with district dispersal instructions.
(9) If radiac equipment is available, place one instrument if it can be avoided.

c. During attack.
(1) When the nuclear burst occurs, TAKE COVER to avoid the initial thermal radiation.
(2) Maneuver the vessel to avoid the base surge.
(3) BRACE FOR SHOCK by firmly grasping a structural member of the vessel, getting up on balls of feet, bending knees, hunching over and attempting to relax the entire body.
(4) When free of the base surge and in fallout, maneuver out of the fallout area.
(a)



(b) "S" turns can be utilized to get maximum effect from water washdown system when leaving sector.
(5) If fallout is expected in the area, all hands TAKE SHELTER at command from the Commanding Officer.
(6) Stations investigate, control, and report structural damage or personnel injury to the bridge.

d. After attack.
   (1) Keep water washdown system activated until intensity is reduced to a safe level, or until CO orders portions secured.
   (2) Rapid survey.
      (a) Purpose: To determine if there is contamination aboard the ship immediately after the burst.
      (b) Made in a rapid manner.
      (c) Vital stations monitored first.
      (d) Air burst - exterior monitoring teams will not be sent topside until 90 seconds after the burst.
      (e) Underwater: Exterior mounting teams will not be sent topside until 10 minutes after the burst.
   (3) Rapid interior survey.
      (a) Same as a rapid survey except the survey is done from inside the ship.
      (b) Rule of thumb for half thickness in reverse applies.
         1. Intensity readings have to be doubled in order to get an estimated reading of topside intensity.
         2. This conversion is done by damage control, not the man taking the reading.
      (c) Rapid interior survey allows for a rapid reading without going topside.

e. Primary gross decontamination.
   (1) Purpose - To reduce the radiation intensity as quickly as possible to a point where personnel can use the object or remain within the area for a limited period of time.
   (2) Use water washdown system.
      (a) This method covers a large area, thus making large scale operation practicable.
      (b) Use hose team to get areas not effectively reached by water washdown system.
      (c) Will reduce contamination about 99%.
   (3) Use soap or other detergents.
      (a) This cuts grease loose where contamination will stick.
      (b) Apply with hot water for best results.

f. Detailed survey.
   (1) Purpose - To determine the radiation level of all areas.
   (2) Must observe the MPE (Maximum permissible exposure), set by the Commanding Officer or command designee.

(3) Readings taken every square yard.
(4) KEEP CLEAR OF HOT AREAS.
(5) Damage control responsibility.

g. Secondary gross decontamination.
(1) Purpose - To reduce radioactive contamination to lowest practical amount.
(2) Based on results of detailed survey.
(3) Under supervision of Damage Control Assistant.
(4) Responsibility for decontamination is that of Department Head.

h. Supplementary monitoring.
(1) Purpose - To monitor objects not normally monitored by monitoring teams.
(a) Food and water.
(b) Salt water systems.
(2) Any readings whatsoever.
(a) Food or water is contaminated.
(b) Is unfit for consumption.

i. Unit or detailed decontamination.
(1) Purpose - To remove all radioactive contaminating materials from the ship or station.
(2) Conducted by:
(a) Shipyard.
(b) Advanced bases.
(c) Repair ships.
(d) Tenders.

j. Use some of these methods.
(1) Sandblasting (wet).
(2) Acid dips.
(3) Scraping.
(4) Flame burning.
(5) Various chemical solutions.

<u>SUMMARY</u>

1. Decontamination.

a. Rapid survey.
Rapid survey is conducted to determine if there is contamination aboard ship.
(1) Rapid internal survey.
Rapid internal survey is conducted to determine the radiation level from the inside of the ship. If this method is used, the rule of half thickness in reverse applies.
(2) Rapid survey may be conducted topside 90 seconds after air burst.

(3) Detailed survey.
 (a) To determine the level of all areas.

(4) Secondary gross decontamination.
 (a) To reduce radioactive contamination to the lowest practical amount.

(5) Supplementary monitoring.
 (a) To monitor objects not normally monitored by monitoring teams.

(6) Detailed decontamination.
 (a) To remove all radioactive contamination from the ship.

TITLE

Personnel Decontamination Procedures

OBJECTIVE

To instruct trainees in the proper procedures of personnel decontamination.

REFERENCE

1. Disaster Control (Ashore and Afloat) Manual.

TRAINING AIDS

1. Blackboard.
2. Have trainees walk through personnel decontamination station.

INTRODUCTION

After a nuclear explosion, it is possible that a number of individuals will become contaminated with radioactive substances. They may also become contaminated after an attack while carrying out their duties as members of repair parties. This lesson will aid on the protection against prolonged personnel contamination.

PRESENTATION

1. Necessity of change and decontamination station.
   - a. Prevents spread of contamination.
     - (1) Contaminated personnel will carry contamination into the ship if no change station is available.
   - b. Decrease hazards to personnel.
     - (1) Contaminated clothing becomes a source of
       - (a) Gamma radiation.
       - (b) Beta and alpha emitters.
     - (2) Prolonged exposure to radiation from contaminated clothing.
     - (3) It becomes apparant that source of radiation must be removed from near personnel.
2. Functions of a change and decontamination station.
   - a. Prevents spread of contamination to interior of ship.
   - b. Reduce radiation hazard to personnel.
     - (1) Accomplished by decontamination.
   - c. Predict radiation casualty by reading personal dosimeter.
   - d. Route casualties to battle dressing station or radiation casualty collection as appropriate.
   - e. Dispose of contaminated clothing.
3. Requirements of a change and decontamination station to carry out its functions.
   - a. Contaminated and clean entrances.
     - (1) To prevent contaminating station and interior of ship a definite route must be established to station.
       - (a) Possibility of rubber matting, wrapping paper, etc.

on passageways to station.
1. When contaminated - dispose.
(2) To prevent recontamination of personnel.
(a) Clean exit must be provided.
b. Containers for contaminated articles.
(1) Ordinary trash bags are sufficient.
(2) Provisions made for segregation of clothing articles.
(a) Decontamination squads outer clothing, boots, masks, etc.
c. Preliminary monitoring.
(1) Dosimeters turned in and read by station personnel.
(a) Men with casualty dose sent to casualty collection station after decontamination.
(b) Men with maximum permissable dose sent to area away from radiation after decontamination.
(c) Permanent record of all reading kept and given to ship's medical officer.
(2) Personnel Monitored.
(a) If available, monitors should check personnel with low rate instrument, tell him of spots to stay away from.
d. Showers.
(1) Should have hot water and soap available.
(2) Personnel entering from contaminated side wash down thoroughly.
(3) Towels should be available on clean side for drying.
(a) Provisions for cleaning or disposing of towels.
e. Final Monitoring.
(1) Monitors check personnel thoroughly.
(a) Personnel still contaminated sent back for another shower.
f. Clean exit to clothing issue.
(1) If available clean clothes issued to personnel.
(2) If clothes unavailable, clean routes to linen lockers should be laid out.
g. It must be in an area where radiation is at a minimum.
4. Procedure used in operating a change and decontamination station.
a. Preliminary washdown.
(1) Men in decontamination squads cloth in waterproof take washdown topside.
(a) Will remove much decontamination from clothes.
(b) Use portable shower or low velocity fire hose.
b. Enter decontamination station through contaminated entrance.
(1) Protective clothing for passageways.
(a) Matting, etc, to aid in decontamination of passageway.
(2) Route to be followed must be marked.
c. Remove outer clothing.
(1) Dispose of in appropriate container.
d. Remove inner clothing.
(1) Dispose of in appropriate container.

e. Preliminary monitoring.
   (1) Personnel turn in dosimeter for readings.
       (a) Dosimeters read, record made.
   (2) If monitor is available - personnel monitored with Lo R instrument.
       (a) Personnel told to pay particular attention to contaminated parts of body.

f. Showering.
   (1) Personnel enter showers through contaminated entrance.
   (2) Soap provided - take vigorous shower.
   (3) Personnel enter clean area for drying.
   (4) Towels disposed of in appropriate container.

g. Final monitoring.
   (1) Monitor with a low rate instrument all personnel carefully.
       (a) Personnel still contaminated are sent back to showers.

h. Exit.
   (1) Clean personnel remove clean dosimeters.
       (a) Personnel with casualty dose sent to radiation casualty collection station.
       (b) Personnel with maximum dose sent away and kept away from further radiation.
   (2) Clothes issued
       (a) If clothes unavailable personnel sent along clean routes to compartments for clothes.

SUMMARY

Personnel decontamination stations are generally classified as permanent, semipermanent and field. Regardless of the classification, however, the facilities employed in radiolofical decontamination do not differ greatly from those used in checmical or biological decontamination. In fact the same facilities should be used, if applicable, for NBC decontamination.

TITLE
Biological Warfare Agents and Procedures.

OBJECTIVE
The objective of this lesson is to provide training that will assist personnel, units and ships in providing an adequate defense against types of biological warfare.

REFERENCE
1. Disaster Control (Ashore and Afloat) Manual.

TRAINING AIDS
1. Blackboard.
2. Pictures in Diaster Control Manual.

INTRODUCTION
The destruction possibilities of disease organisms are well established. Medical and military history records many instances of large scale pestilence, destruction and death produced by germs. For this reason all Coast Guard personnel must be fully trained in procedures of Biological Warfare.

PRESENTATION
1. Types of agents. (Write on blackboard)
   (a) Micro Organisms.
   (b) Toxins.
   (c) Vecters of disease (arthropeds) insects.
   (d) Pests (of animals and plants).
   (e) Chemical compounds.
      (1) Microorganism Groups:
         (a) Bacteria - Very small single cell organism, 0.5 to 10 microns.
         (b) Rickettsiae - Smaller than bacteria, range in size .3 to .5 microns.
         (c) Virus - Smallest of the microorganisms group. Range in in size from 10 to 270 millimicrons.
         (d) Fungi - Very large unicellular or multicellular member of the plant kingdon, but without chlorphyl, the green coloring matter, range in size from 3 to 50 microns.
         (e) Protozoa - The Protozoa are unicellular nucleated organisms and are the smallest, most primitive and most elemental representative of the animal kingdon. Range in size from 1 to 100 microns or more.
2. General nature of agents injurious to man. (write number 8 and 9 on blackboard).
   a. Bacteria: Usually considered one of the best antipersonnel agents.
      Some diseases caused by bacteria
      (1) Anthrax
      (2) Bacillary dysentery
      (3) Botulism
      (4) Bubonic plague
      (5) Diptheria
      (6) Gas gangrene

(7) Scarlet fever (9) Tetanus
(8) Typhoid fever (10) Tularemia

b. Rickettsiae: Good man and animal agent. (Write number 1 and 2 on blackboard.)
Some diseases caused by the rickettsiae
(1) Endemic Typhus Fever.
(2) Epidmie Typhus Fever.
(3) Scrub Typhus.
(4) Spotted fever.

c. Virus: Good man, animal and plant agents. (Some diseases caused by virus.
(1) Animal diseases.
(a) Hoof and mouth disease. (write on blackboard)
(b) Rinder Pest - clove footed animal.
(c) Newcastle.
(d) Fowl Plague.
(e) Hog cholera.
(2) Human Disease.
(a) Infantile Paralysis. (write on blackboard)
(b) Rabies.
(c) Small pox. (write on blackboard)
(d) Yellow fever.
(e) Encephalitis.
(f) Influenza.
(g) Common cold.
(h) Psittaeosis - Parrot fever.

3. Requirements to qualify as BW agent.
a. Must be Pathegen, or capable of causing a disease.
b. Must be easy to produce in large quantities.
c. Must be stable in storage for long lengths of time, about 6 months.
d. Should be difficult to detect.
e. Should be contagious.
(1) Physical contact.
(2) Dropplet spray.
(3) Fomites.
f. Should be rapid in action (short incubation period).
g. Should be persistent. Linger in area for a long term.

4. Psychological use of BW.
a. Reduce the will of the people to make war by affecting the morale of personnel.
b. Will cause.
(1) Fear.
(2) Panic.
(3) Mass hysteria.
(4) Hatred.

5. Strategic uses of BW.
   a. Reduce the means of making way by incapacitating personnel, interrupt war production.
   b. Reduce the means of making war by attacking livestock and destroying crops and agricultural products.
6. Tactical uses.
   a. Against strong holds.
      (1) Islands.
      (2) Naval bases.
      (3) Air bases.
      (4) Army camps.
      (5) Ships at sea.

      The medical department is responsible for the identification of the samples.
7. Decontamination.
   a. The process of making any contaminated object or area safe for unprotected personnel by either removing, covering, or destroying the biological warfare agent.
   b. Equipment needed for decontamination.
      (1) Deck scrubbers.
      (2) Buckets and GI cans.
      (3) Three gallon spray pump M1.
      (4) Protective mask MK-5, M9A1, or M17.
      (5) Protective clothing.
         (a) Impermeable - M3.
         (b) Impregnated (permeable).
      (6) Wash down hoses.
8. Methods of delivery (munitions).
   a. Manned aircraft.
      (1) Bombs containing BW agents.
      (2) Aerosols spray devices.
   b. Projectiles.
      (1) 8 inch howitzer.
      (2) Naval guns.
   c. Guided missiles and rockets.
      (1) Long range.
      (2) Short range.
   d. Miscellaneous delivery.
      (1) Balloons.
      (2) Parachutes.
      (3) Flying animals - birds, bats.
      (4) Insect vectors.
      (5) Small animals - rats.
      (6) Spray and aerosol devices.

SUMMARY

Biological Warfare is defined as the use of living agents, such as bacteria, viruses, and other pathogenic micro-organisms, or their toxic products, to produce disease or death of personnel, animals or plants. The term biological is preferred to bacteriological because it included the use of insects and other destructive pests as vectors or carriers.

e. Immediate self aid treatment.
   (1) Stop breathing momentarily.
   (2) If agent is in eyes, immediately wash with water. Do not apply BAL in eyes. Do not use M-5 in eyes.
   (3) Decontaminate face with M-5 ointment.
   (4) Don protective mask.
   (5) Decontaminate rest of body with M-5. If skin is reddened, do not use M-5.

f. First aid treatment.
   (1) Decontaminate victim before admitting to sick bay.
   (2) Apply dry, sterile dressing to blisters. DO NOT BREAK BLISTERS.
   (3) Sedatives, by doctor only, for lungs, eyes, or systemic effects.

g. Decontamination.
   (1) Contamination may be severe.
   (2) Water wash down system for weather surfaces.
   (3) Bleach slurry or DANC solution for secondary decontamination.
   (4) Steam for compartment decontamination. (if applicable)
   (5) Wear protective clothing and daub M-5 before entering contaminated spaces.

4. Choking gases (lung irritants) are chemical agents which, when breathed, cause inflammation and irritation of the nose, throat, windpipe, lungs and eyes.

AGENT	SYMBOL	PERS	LOW OPER TEMP	ODOR
a. Phosgene	CG	N-P	-20°	New mowed hay
b. Diphosgene	DP	P	0°	New mowed hay
c. Chlorpierin	PS	P	-	Fly paper

d. General properties, chemical and physical.
   (1) Forms acid and carbon dioxide in presence of water.
   (2) Acid is corrosive to metal.
   (3) Not useful in rain or high humidity. (Hydrolysis)

e. Diphosgene.
   (1) Decomposes to form phosgene, therefore, has same general properties.
   (2) More persistent than phosgene. (Usually up to 30 minutes)

f. Physiological action.
   (1) Casualty effects on lungs, slight irritation of eyes, nose, throat are possible, not serious.
   (2) In lungs, CG and DP hydrolyze, form acid which destroys lung tissues.
   (3) Completely cumulative effects (small doses will add up to lethal or incapacitating effects).
   (4) Early symptoms (may or may not appear).
      (a) Coughing, irritation of eyes and throat.
      (b) Slow pulse.
      (c) Symptoms disappear, symptom free for 2 - 24 hours.

(5) Late symptoms (2 - 24 hours)
(a) Rapid shallow breathing, painful cough.
(b) Shock - prostration, nausea, vomiting.
(c) Possible death within 48 hours.
(6) Probable survival after 48 hours, lung infection likely. (pneumonia)

g. Immediate self aid treatment.
(1) Stop breathing momentarily.
(2) Don protective mask at first indication of exposure.
(3) Continue normal duties until incapacitating symptoms set in.
(4) Then rest, keep warm, avoid activity.
(5) Seek medical attention.

h. First aid and treatment.
(1) Mask victim, if agent vapors are present.
(2) Treat for shock, keep victim warm, rested, lying down with head lowered.
(3) Give stimulants, if conscious. (NOT alcohol)
(4) Give oxygen, if available.

i. Decontamination.
(1) Aeration of spaces, usually adequate.
(2) For any persistent effects (unlikely) - alkaline water wash, such as boiler compound, lye, soap, etc.

5. Blood poisoning gases are agents which are taken by the blood and interfer with the absorption and distribution of oxygen and act primarily upon nerve centers affecting breathing, hearing action and other organs of the body.

AGENT	SYMBOL	PERS.	LOW OPER TEMP	ODOR
a. Hydrocyanic acid	AC	Non	10°	Peach pit
b. Cyanogen c. Chloride	CK	Non	30°	Irritating

d. General properties, chemical and physical.
(1) Stable for long term in storage.
(2) Cyanogen chloride breaks canister more readily (30 min or less).

e. Physiological action.
(1) Blood poision prevents oxygenation of tissues by blood, causing suffication.
(2) Nervous system also affected, in seconds, control over breathing, and other vital functions lost, victim stops breathing.
(3) Symptoms - Immediate, very incapacitating.
(a) Deep, gasping breaths, which quickly step.
(b) Convulsions.
(c) Collapse (20 - 120 seconds)
(d) Pink color of skin.
(4) Body can throw off effects in time - not cumulative. (quick death or probable full recovery in several days.)

(5) CK, same as (AX), plus irritation of eyes, upper respiratory tract, lungs.
(6) All concentrations cause eye irritation and lacrimation.

f. Immediate self aid treatment.
(1) Stop breathing momentarily (difficult due to uncontrolled gasping.)
(2) Don protective mask.
(3) If symptoms warrant, break and inhale, (2) AMYL NITRATE AMPOULES (slip under mask). Do up to 3 times, spaced 15 minutes apart. You can use up to a total of 8.
(4) Get to fresh air - Cyanides can break the canister on your mask.
(5) SPEED IS ESSENTIAL.

g. First aid and treatment.
(1) Mask the victim, administer 2 amyl nitrate ampoules.
(2) If necessary, give artificial respiration.
(3) PROTECT YOURSELF, wear protective mask, if possible. Get to fresh air.
(4) Seek medical attention.

h. Decontamination.
(1) Aeration.
(2) For any persistent effects (unlikely), alkaline water washing, such as boiler compound, lye, soap, etc.

6. Nerve gases act primarily on the nerves and muscles causing paralysis of the respiratory organs and loss of control of the body. They are readily absorbed through any body surface.

AGENT	SYMBOL	PERS	LOW OPER TEMP°F	ODOR
a. Tabun	GA	Highly	-65°	Slight, fruity
b. Sarin	GB	Highly	-36°	Odorless
c. Seman	GD	Highly	-36°	Odorless

d. The Psysiological action.
(1) The nerve enzyme (cholinesterase) is destroyed; the nervous system is over stimulated, muscles become contracted throughout the body.
(2) Eye, lung, and skin hazards exist in this order. Eye is the most susceptible. Small drop in eye will kill a person.
(3) Effects are cumulative (several weeks), small doses will add up to large lethal or incapacitating effects.
(4) Early symptoms (one minute).
(a) Tightness in chest, difficulty breathing.
(b) Pinpointing of the eyes, dimming of vision.
(c) Runny nose, watery mouth.
(d) Twitching muscles.
(5) Later casualty symptoms (2 - 10 minutes)
(a) Uncontrolled convulsions, panic.
(b) Breathing stops, collapse, death.

e. Immediate self aid treatment.
   (1) Stop breathing momentarily.
   (2) If agent is in eyes, immediately wash eyes with water unless speedy action is taken, death indicated.
   (3) Don protective mask.
   (4) If symptoms warrant, inject atropine deep in thigh or buttock muscle. (1'syrette only).
   (5) Wash liquid contamination off skin with soap and water if possible and remove contaminated clothing.
   (6) Shower thoroughly as soon as possible.
   (7) Watch symptoms closely.

f. First aid and treatment.
   (1) Mask victim, make an attempt to decontaminate eyes.
   (2) Inject atropine, one shot.
   (3) Give artificial respiration, if necessary.
   (4) Get victim to sick bay AFTER DECONTAMINATION.
   (5) Take care of yourself, wear protective mask, get to fresh air, if possible. Avoid spread of contamination from victim to yourself.

g. Decontamination.
   (1) Contamination may be severe.
   (2) Water washdown for weather surfaces.
   (3) Alkaline solutions.
   (4) Steams for compartment decontamination if applicable.
   (5) Wear protective clothing, daub M-5 on before entering contaminated spaces. M-5 seals the skin but does not destroy the agent.

7. Harassing agents are agents which enter or are inhaled, even from extremely low concentrations will cause coughing, sneezing, heacache, pain in the nose and about the teeth, followed by nausea and temporary physical weakness. Lacrimators cause temporary eye pain and produce a heavy flow of tears, and may cause irration to skin.

AGENT	SYMBOL	PERS	LOW OPER TEMP	ODOR
a. Adamsite (vomitinggas)	DM	Non		Coal smoke
b. Chloracetophenone	CN	Non		Apple blossom

c. General properties, chemical and physical.
   (1) Vomiting-must be vaporized or blown as a dust by exploding munitions.
   (2) Can be used with smoke pots. Usually has a yellow color.
   (3) May be dissolved in Chloroform or Benzene to enable spraying.

d. Physiological action.
   (1) Vomiting-aresenical irritant, arsenic poisoning a possibility, but not important usually.
   (2) Symptoms (almost immediate, several seconds).
      (a) Irritation of eyes, nose, throat, some lacrimation (tears).
      (b) Peppery feeling in nose, sneezing.
      (c) Quick nausea, vomiting, intense headaches.

(3) Lacrimators very intense pain in the eyes.
(a) Heavy flow of tears.
(b) Stinging on moist skin, painful but not casualty status.

e. Immediate self aid treatment.
(1) Vomiting - stop breathing momentarily.
(2) Don protective mask.
(3) Keep mask on even if vomiting - toxic agent may be present
(4) Get to fresh air, rest, take aspirins for headache.
(5) Lacrimator - same as 1,2, 3. Wash eyes and body with water.
(6) Do not rub eyes.

f. First aid treatment.
(1) Same as self aid.
(2) Chloroform for violently sick eases in vomiting agents, but only under supervision of a doctor. Chloroform is dangerous.
(3) Lacrimators - same as self aid.

g. Decontamination.
(1) Vomiting - aeration of spaces is usually adequate.
(2) Water may be used to wash off any dust which may deposit.
(3) Lacrimators - aeration of space is usually adequate.
(4) Water may be used to wash off any CN which may be deposited on surfaces.

8. CW History. CW has ancient history, predating high explosives by more than 1,000 years.
a. CW in modern sense made its debut in WWI.
(1) First used effectively April 1915.
(2) First gas used was Chlorine, dispersed from Pess. Cyl. caused 20,000 casualties and 5,000 deaths.
(3) Gas mask gave complete protection - Allies did not have masks, used wine bottles filled with sand. In several attacks, shifting winds caused casualties among attackers. Chlorine was cheap, available, though not too toxic. It was very effective against unprotected personnel. It was easy to detect and protection (using gas mask) was effective; mask soon issued to all Allied troops.
(4) Toxic, harder to defend against agents, mustards, were thrown against the Allies in July 1917. Later vomiting agents were coupled with the mustard attacks.
(5) Allies soon progressed beyond the defensive stage and began counter offensives of their own. By obtaining vital information from captured German munitions, mustard and other CW agents were produced and perfected to a point where demands were met for Allied forces.

9. Screening Smokes and Incendiaries.
a. Biblical times.
b. WWI, limited use, 1906 experimenting.
c. WWII, used extensively.
(1) Material damage rather than inflicting casualties.

d. Thermite or Thermate (TH)
   (1) Aluminum and iron exide, heated, violent reaction. Heat is generated, molten slag is produced.
   (2) WWII, US produced 2,000,000 thermite bombs.
   (3) Fires are localized.
   (4) Sulfur, resin, parafin, and pitch were added.

e. Magnesium (MG).
   (1) Developed during WWII and used successfully.
   (2) Replaced Thermite bombs.
   (3) US manufactured 200,000,000 - 4 pound bombs.
   (4) 2 lb bombs also manufactured

f. White phosporous (WP).
   (1) White variety is more effective.
   (2) Vapor extremely poisonous.
   (3) Ignites spontaneously.
   (4) Must be stored under water.
   (5) Very corrosive toward metals, but does not poison foods.

g. Napalm (NP).
   (1) Used against Japanese 1942 (Guadalcanal).
   (2) Flame throwers, bombs, tanks.
   (3) Must have thickener, coconut oil (NP).
   (4) Forms jelly, scatters, sticks, burns slow. (Personnel)

h. Petroleum oil smoke.
   (1) Used during WWII.
   (2) Smoke generator, injected in form of spray.
   (3) Dense white smoke.

SUMMARY

Chemical warfare agents are those material, liquid, solids, and gases which produce lethal, injurious, or initiate anti-personnel affects. Also included are materials used as screening smokes and incendiaries. Review self aid on all types of gases.

NUMBER F025

TITLE

Chemical Detection Kits

OBJECTIVE

To instruct trainees in the use and features of the M18 and M15 chemical detector kits.

REFERENCE

1. Disaster Control (Ashore and Afloat) Manual

TRAINING AIDS

1. Blackboard.

INTRODUCTION

The chemical agent detector kit M18 and M15 are used for reconnaissance in areas that are suspected to be contaminated with chemical agents. Therefore this lesson is intended to familiarize personnel with the use and technique of the equipment.

PRESENTATION

1. Kit, Chemical Detector, M18.
    a. Only two solutions are requied; the blue top and the green top.
    b. M-6 paper is furnished with the kit.
    c. Two rubber bulbs are furnished for drawing the samples instead of the pump.
    d. The blue dot tubes do not have aluminum foil for heating. No heating is required.
2. The green top tube must be mixed fresh each 24 hours as with the M9A2.
3. Color of tubes and specific agents are:
    a. Blue - For G (nerve), HD (mustards), and CK (Cynogen chloride).
    b. Brown - for AC (acid, cynide).
    c. Yellow -for L (lewisite).
    d. Green - CG (Phosgene).
    e. White - Unknown agents.
4. Specific tests for the agents (in the order they should be made):
    a. G-agents (Nerve)
        (1) A blue dot tube is used and 50 bulb compressions are made. One drop of the green top reagent solution is applied to the inside of the tube.
        (2) Yellow coloration will appear inside the tube within one minute.
    b. = CK (Cyanogen chloride)
        (1) A blue dot tube is used and five bulbs compressions are made. No reagent is required.
    c. HN (nitrogen mustard), HD (mustard).

(1) A blue dot is used and 12 bulb compressions are made. If temperature is below 65°F, warm in hand for 2 minutes before adding reagent solution. One drop of blue top reagent or just enough to wet silica gel.

(2) Purple blue indicates blister agent.

d. L (Lewisite).

(1) A yellow dot tube is used and 12 bulb compressions are
] made. Blue top reagent just enough to wet silica gel.

(2) Blue band indicates L.

e. GG (Phosgene).

(1) A green dot tube is used and 5 bulb compressions are made. No reagent is required.

(2) Green band indicates GG.

f. AC (acid cyanide).

(1) A brown dot tube is used and 5 bulb compressions are made. No reagent is required.

(2) A blue color indicates AC if G test was negative; GA or AC if it was positive.

g. AC (acid cyanide).

(1) Use white dot tube and take 75 bulb compressions. Take samples on every tube.

(2) Place exposed tubes in envelope with completed report form and turn into the CW Officer for shipment to a laboratory for analysis.

5. Kit, chemical agent, M-15.

a. A rubber bulb is used to draw the air samples through the tube.
b. Only two reagent solution bottles are required.
c. Only one type tube is usedl the blue dot tube.
d. Only nerve and blister agents are detected.
e. No M-7-1 cryon is supplied with the kit.

6. The green top reagent solution must be mixed fresh each 24 hours, as in the M9A2 and the M-18.

7. Specific test for the agents (in the order they should be made).

a. G-agents

(1) With a new tube in bulb, compress and release bulb 50 times. Add liquid from greep top reagent bottle until silica gel is wetted.

(2) Yellow coloration will appear inside the tube within 1 minute if G-agent is present.

b. HD (mustard).

(1) With a new tube in bulb, compress and release bulb 12 times. If temperature is 65°F or above, let stand for 2 minutes. All liquid from the blue top reagent bottle until silica gel is wetted.

(2) Purple-blue band or ring will appear immediately if HD mustard is present.

8. Do not use detector tubes or contents of vials after discard dates.
9. Store in a cool dry place. Storage at temperature above 120°F for extended periods of time renders kit useless.
10. When detecting at night, the detector tube may be observed for color development with the aid of a flash light.
11. Safety precautions.
    a. Never allow a man that is color blind to be a member of a CW agent detection team.
    b. Never interchange tubes or reagent solutions with different number kits.
    c. The chemicals in the silica gel and regeant are different in the different kits.
    d. Never allow men to unmask until negative tests have been obtained and then only for the prescribed times listed in the instructions in the kits.
    e. Tests will not be reliable unless bulb is completely deflated and allowed to inflate fully for each bulb compression.
    f. The piston in the pump must be held back until it has no tendency to decompress; otherwise, the proper volume of air will not be drawn through the nose.

SUMMARY

The M18 detector kit contains sufficient equipment and supplies to detect and identify dangerous concentrations of eight of the most common chemical casualty agents. The basic components of this kit are a rubber atomizer bulb, various detector tubes, and checmical reagents.
The M15 and M15A1 kit are simplified M18 and M18A kits, are smaller in size and are primarily designed to detect dangerous concentrations of mustard, distilled mustard and nerve agents. Instructions are included with the individual kits.